NINETY-EIGHTH YEAR

AMERICAN

Gas Journal

APRIL, 1957

Only Magazine Published Exclusively for the Gas Utility Industry

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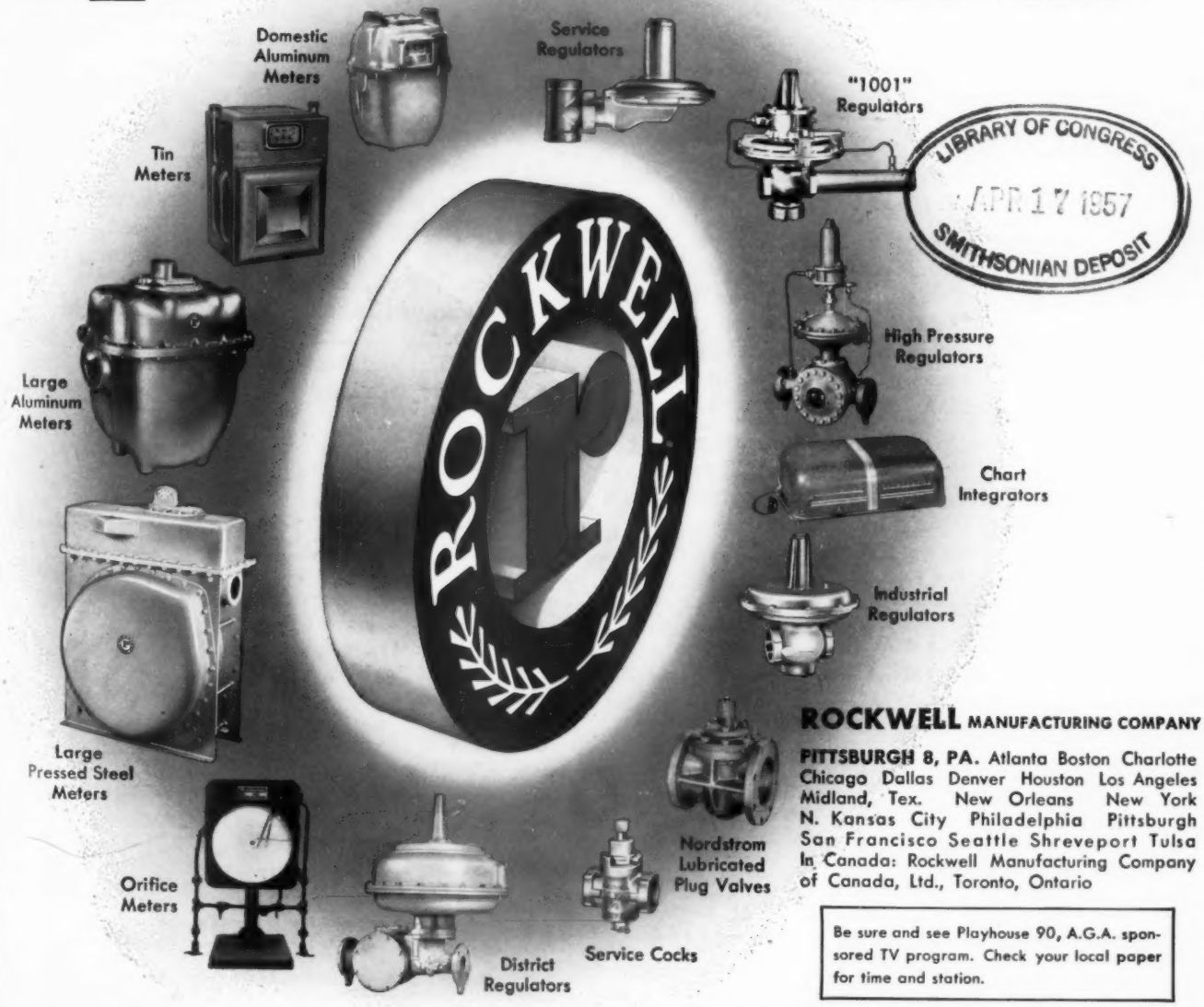

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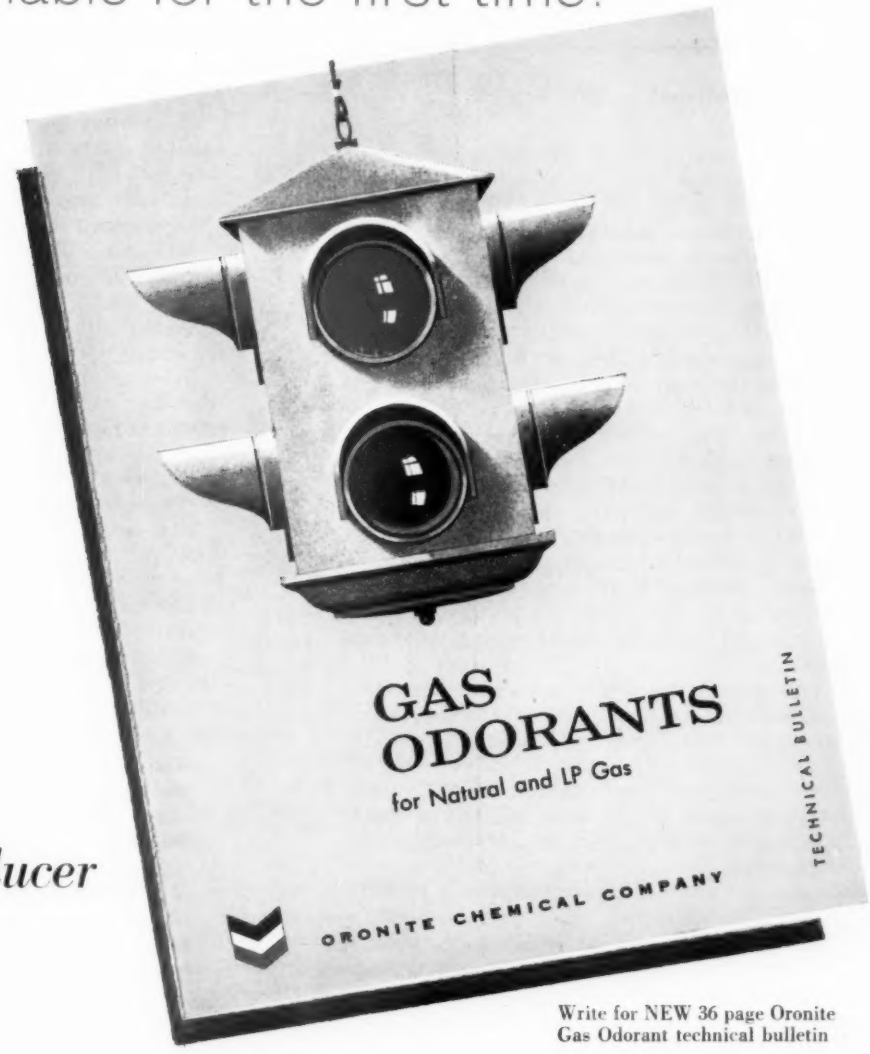

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Memo From The Editors

Fuel for Thought

GAS utility companies, by and large, are growing at a fairly rapid rate — so fast, perhaps, that the days of "opportunity profit" will soon be gone. Inevitably, the companies will have to turn to better management and organization if they are to continue to be profitable. This summation of a major problem in the gas utility industry was presented by Mr. Louis A. Allen, manager of organization planning for the national management consulting firm of Booz, Allen, and Hamilton at the AGA General Management Section conference at Biloxi in late March.

Mr. Allen points out that our industry has seen a tremendous acceleration — revenues jumped from $1.2 billion in 1946 to $4 billion in 1956 and will reach $5.2 billion in 1960 — with profits ranging from good to excellent. The kick comes in that, while continued growth is a certainty, the maintenance of profit ratios is not. Factors affecting net income growth include higher gas costs, higher costs of new capital, and slowness of regulatory bodies to respond to rate increases.

As a company grows, Mr. Allen notes, the necessity for changes in management practices becomes greater. All companies start small. In most, early growth is traced to the dominant influence of one or a few individuals. Authority is strongly centralized in such a functional organization. Sooner or later, however, every company outgrows this type of management and organization. No one person can continue to make all the complex and difficult decisions for a growing and diversifying enterprise.

Death or retirement of the strong leader usually brings a crisis. This is often seen in the loss of competitive position, decline in sales, failure to maintain leadership in engineering, operations, distribution, purchasing or other critical areas of a company's business.

A common danger signal, Mr. Allen relates, may be seen when a top executive is surrounded by a profusion of assistants, committees, and coordinators. The executive becomes so immersed in day-to-day problems and routine that he no longer plans ahead and anticipates the problems and predicaments of tomorrow. This is when continuity and profitability are most seriously threatened.

Solution of the problem is found in two forms — revolutionary upheaval or methodical transition. Revolutionary upheaval brings fear, insecurity, discontent, and diminished efficiency. The painless transition from one kind of management and organization to another is the better approach.

Five basic steps outlined by Mr. Allen for transition include (1) development of professional management concepts; (2) improved delegation; (3) decentralization; (4) management development, and (5) management incentives.

Our industry has many small companies growing big. Mr. Allen's advice should be taken seriously. To continue to be successful while becoming larger, more dispersed, and more varied in activities, and to be operated efficiently and profitably means that management concepts must also change. They must be flexible enough to meet every situation.

In This Issue . . .

Getting the gas to the customer with reliability and safety is always chief in the minds of distribution engineers. Across the country countless new ways of solving distribution problems are being developed, and for this issue, we've rounded up a few of these "top drawer" ideas.

At Victoria, Texas, Houston Natural Gas maintains pressures on its system with a unique automatic, unattended control system that raises or lowers delivery pressures at three city gates to meet demands — a system that thinks for itself.

In Houston, United Gas Company's distribution engineers no longer calculate system improvements by wearing out pencils and using tons of paper; instead, they've developed a simple, linear-type network analyzer that does it quickly and reliably. Their "electronic gadget" could be adapted by almost any company with a "do-it-yourself" knack.

Who says old ideas can't be used anew? Northern Illinois Gas and Graver Tank & Mfg. Co. engineers put their heads together and worked out an efficient and safe device for overpressure protection on the gas company's low pressure distribution systems.

And in Pittsburgh, dispatchers for Manufacturers Light and Heat Company are pushing buttons to speed operations in controlling pressures on their vast system — while proving that "automation" really pays dividends.

Response to the "Handy Reply Card," initiated with the March Issue, has been terrific! Thank you. We'd like to point out that — by using this card — you can get an answer in 10 days to your inquiries on the New Equipment and Literature items presented in each issue of AMERICAN GAS JOURNAL. Just circle the items you want to know more about — and mail the postage paid card to us. All you need is a pen or pencil.

Following up the highly successful series on "Better Communications," we begin with this issue a new series on "Toward Better Management." Each chapter will bring a new and fresh idea on solving a particular problem in management practice — ideas for everyone from the serviceman with a desk in the corner of the shop to the chairman of the board. A host of practical management consultants are penning the articles for us.

Letters

EDITOR:

Your January issue contains a rather unusual section called "Outlook for 1957." I was greatly impressed with the several reviews appearing on pages 13-19. You have shown excellent judgment in selecting these industry leaders and I feel that you have done the industry a service by presenting the varied opinions and prophecies which these men have made about the gas industry in their particular area.

Congratulations. Best wishes for a continuing service to this great industry.

Bruce A. McCandless,
Assistant Managing Director
American Gas Association, New York City

EDITOR:

Your 1956 Handbook issue is excellent. We find good use for it and appreciate having it for reference. Thanks.

B. D. Bergie, Gas Superintendent
Interstate Power Company
Albert Lea, Minnesota

American Gas Journal

Established July 1, 1859

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AMERICAN **Gas Journal** NINETY-EIGHTH YEAR

GAS TECHNOLOGY — OPERATIONS — EQUIPMENT — MANAGEMENT — UTILIZATION

VOLUME 184 **April, 1957** NUMBER 4

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APR 11 1957

Mcf

Five point program outlined by the FPC in its annual report to Congress for 1956 may help new natural gas legislation through the current session. Recommendations made by the commission include: (1) Elimination of requirements for "certificates of public convenience and necessity" for natural gas producers; (2) a pricing or evaluating standard considering natural gas as a commodity that would not require use of a rate base or traditional utility rate-making principles—yet enable the FPC to weigh interests of consumers against necessity of providing assurance of future gas supplies; (3) elimination of any mandatory requirement for determining and considering costs of and revenues from products obtained in conjunction with producing natural gas; (4) same treatment for independent producers and pipeline producers with respect to pricing natural gas, and (5) elimination of escalation clauses based on changes in price received by purchaser on resale or changes in price offered by other purchasers or sellers.

Continued growth of the nation's natural gas pipelines, bringing greater quantities to market, seems assured if the steel pipe market is any gage. Sales of electricweld large-diameter pipe are "sewed up" through 1960, with 80 percent of the big pipe slated for gas transmission companies and 20 percent to crude and products pipeline users. A similar situation is said to exist with producers of large-diameter seamless pipe, but not for as long a period. Seamless mills do not commit themselves that far ahead.

Further encroachment by the Federal Government into private enterprise, particularly the gas industry, has been suggested by a Michigan congressman. The representative said he might introduce legislation that would give the FPC authority to require gas companies under its jurisdiction to provide service where the commission thought it feasible. The suggestion came after FPC chairman Kuykendall appeared before congress recently, wherein he related that the FPC has no authority to require pipeline companies to extend their lines. Rep. Bennett (R-Mich.) noted that rural areas wanting electric power could form co-ops, borrow government money, and build supply lines. He wondered if such a plan could not be worked out to aid certain areas in gaining access to natural gas—areas that gas companies have passed up as being highly unprofitable.

American industry will spend a minimum $1-billion in the next three years to modernize office procedures to keep pace with the country's fast-growing economy, an expert predicts. Obsolete equipment and procedures are causing business to lose money rapidly in the struggle to stem a mountainous tide of paperwork, says Walter W. Finke, president of the Datamatic Corporation. Modernization will mean increased use of computers and modern office equipment. Utilities will be among the businesses that will gain by utilizing the new equipment and methods.

Arkansas' governor has signed a bill that legalizes a "fair field" price theory of rate-making for natural gas companies. Action by the state's legislature and executive office came immediately after the Arkansas Supreme Court over-ruled a $4,300,000 rate increase by Arkansas Louisiana Gas Company to large industrial customers, granted in 1955 by the state PSC. The fair field price theory—which holds that a gas company should receive as much for gas it produces as it pays for gas it buys—was basis for the increase.

Industrial growth in Florida will come at a swifter rate, now that a supply of natural gas has been assured. Work on the first gas pipeline to the state is expected to begin soon. Among industries that will benefit from the new fuel are container manufacturers, glass plants, printing and textile finishing operations, food drying, aircraft manufacture, chemical manufacture, and metals treatment. Among the biggest benefactors will be Florida's electric utilities, who will use a vast amount of the available gas supply to produce power.

Annual dividend payments on natural gas common stocks continued to show increases for the seventh month in February, AGA reports. February dividends averaged $1.91 a share for a year-to-year gain of 9.8 percent. Natural gas common stock price index for February was slightly under the all-time high of January, but was 10.3 percent over the year-previous period.

Regulation of direct industrial sales of Colorado Interstate Gas Company by the Colorado PUC would only mean higher prices for residential customers, CIG president W. E. Mueller told a state house of representatives committee recently. A bill regulating such sales and declaring CIG a public utility in such sales is currently receiving legislative attention. Mueller pointed out that his company is already regulated by the state PUC and the FPC in sales to distribution companies.

Gas sales continue to climb, according to AGA reports. January natural gas sales were up 5 percent over January, 1956, and showed a year-to-year gain of 7.1 percent. Because of continued conversion to natural gas, manufactured and mixed gas sales were down 31.2 percent in the same 12-month period. For the year ended January 31, total sales showed a gain of 8.5 percent.

FPC Highlights. Rate filings of two companies planning to serve Florida — Coastal Transmission and Houston Texas Gas and Oil—have been accepted by the FPC . . . El Paso Natural Gas has asked authority to build $107,100,000 in new facilities in Texas and New Mexico—216 miles of 6 to 34-in. pipeline and 533 miles of field lines, plus 58,900-hp for mainline stations and 27,850-hp in field units . . . a new map, FPC M-48, dated December 31, 1956, showing major natural gas pipelines, has been issued by the commission; price—25 cents each . . . approval has been given Transcontinental Gas Pipe Line to build 350 miles of new line on its system to raise capacity to 832,944,000 cu ft per day . . . in same action, FPC denied Trans-Carolina Pipeline Corporation permission to build an interstate line to serve the Tidewater areas of the Carolinas in favor of intrastate service by Carolina Pipeline Company and North Carolina Natural Gas Corporation, two intrastate firms authorized by their respective state commissions.

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Sizes 1" through 2".

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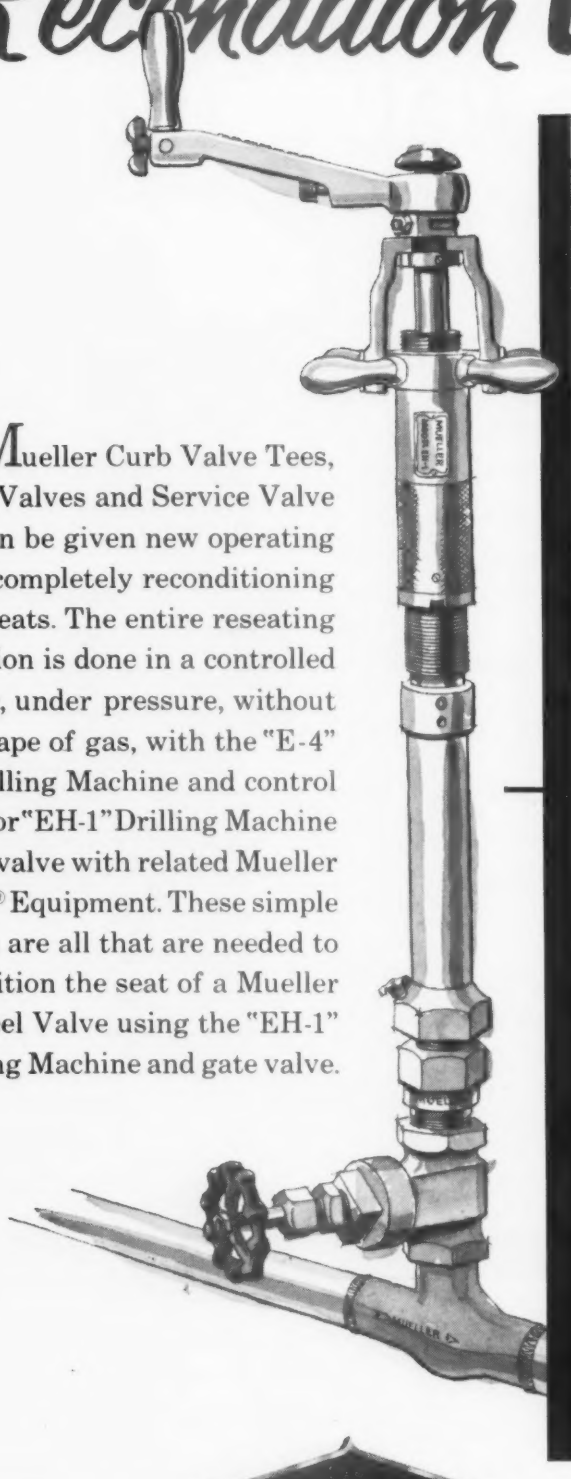
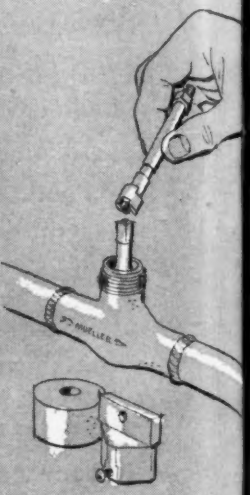


Mueller Curb Valve Tees, apped Steel Valves and Service Valve Tees, can be given new operating life by completely reconditioning valve seats. The entire reseating operation is done in a controlled manner, under pressure, without escape of gas, with the "E-4" Drilling Machine and control chamber or "EH-1" Drilling Machine and gate valve with related Mueller NO-BLO® Equipment. These simple steps are all that are needed to recondition the seat of a Mueller Steel Valve using the "EH-1" Drilling Machine and gate valve.

STEP 1

Prepare fitting. Close the valve tightly. Remove tee handle and cap. Attach extracting tool to valve stem. Open gate valve and attach to valve body. Mount drilling machine with adapter nipple to gate valve. Be sure that bleeder valve on the drilling machine is closed.



STEP 4

Install stem. Attach valve stem and inserting tool to boring bar. Mount machine, open gate valve and advance boring bar until stem threads contact top thread in valve body. Rotate ratchet handle clockwise until stem is seated solidly against seat.

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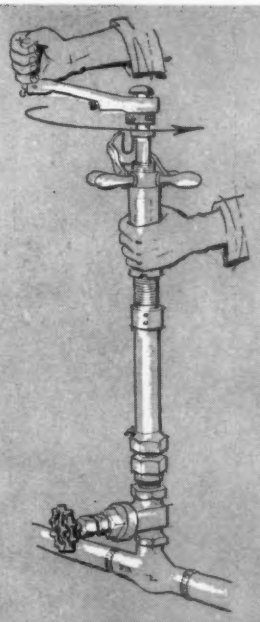
under pressure!



STEP 2

emove stem. Lower bor-
g bar to contact extracting
ol. Rotate ratchet handle
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reads. Continue counter-
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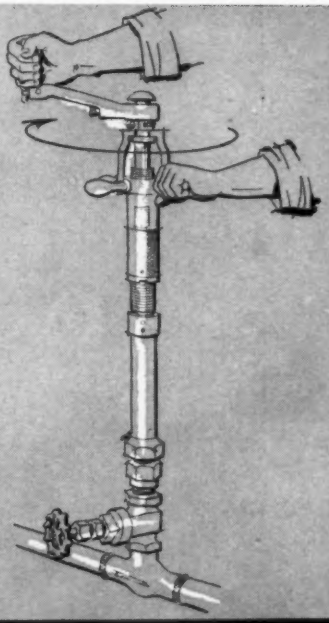
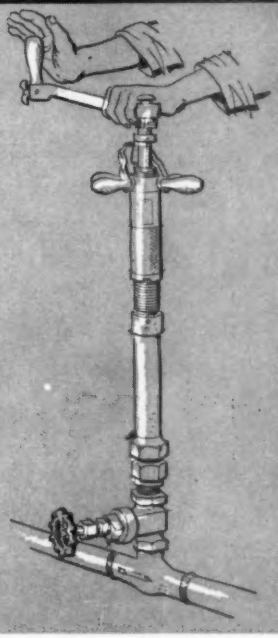
oring bar, close gate valve,
pen bleeder valve, remove
achine.



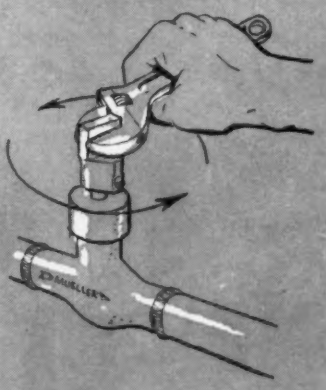
STEP 3

Ream seat. Attach reseating reamer to boring bar. Remount, open valve and lower reamer against seat. Adjust the feed yoke, applying light pressure while rotating handle clockwise. Remove yoke, retract boring bar, close gate valve, open bleeder valve and remove machine.



STEP 5

emove machine. Strike
tchet handle sharply in a
unter-clockwise direction
ith hand to free inserting
ol. Unscrew inserting tool
om stem. Retract boring
ar. Open bleeder valve to
heck for tightness. Remove
achine and gate valve.



STEP 6

Cap valve. Lubricate "O" rings in steel cap and screw tightly onto valve body. Install tee handle on valve stem. Reseating operation is now complete and valve may be placed back in operation in "like new" condition.

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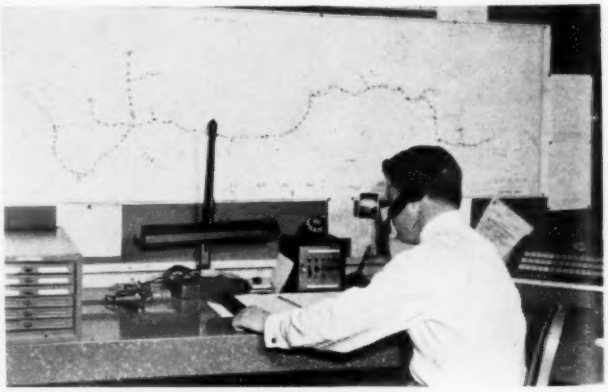

Pacific Northwest's Salt Lake City dispatchers collect data hourly from every compressor station and maintenance point on the company's 1487-mile pipeline.

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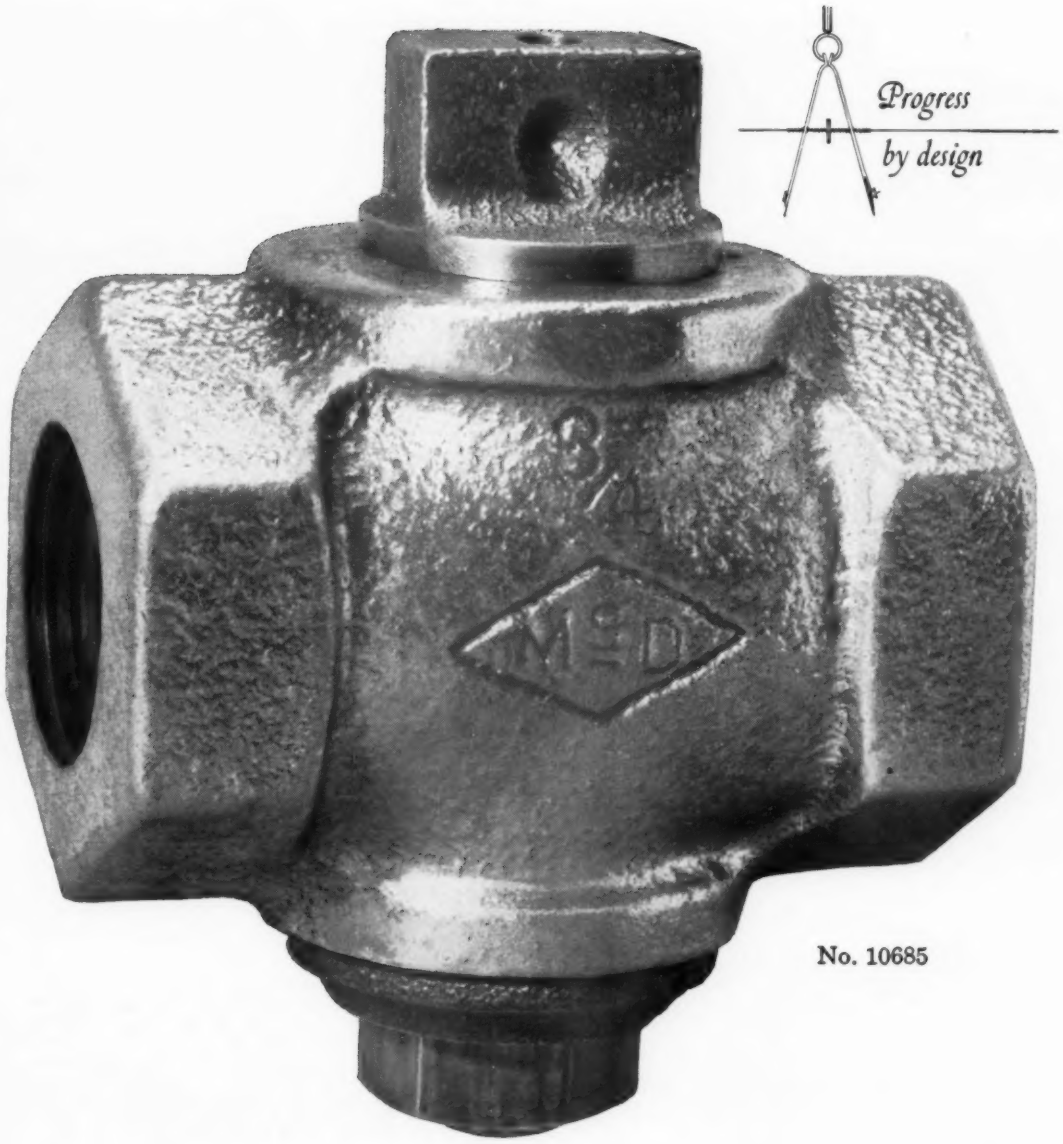

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20 psi inlet	25000 CFH
50 psi inlet	48000 CFH

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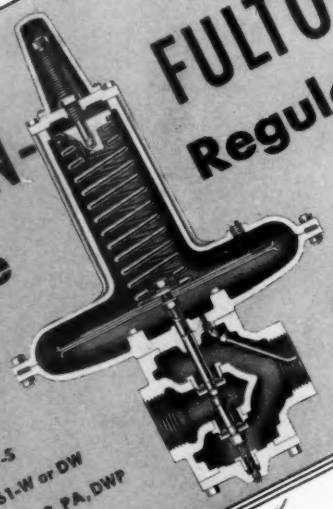

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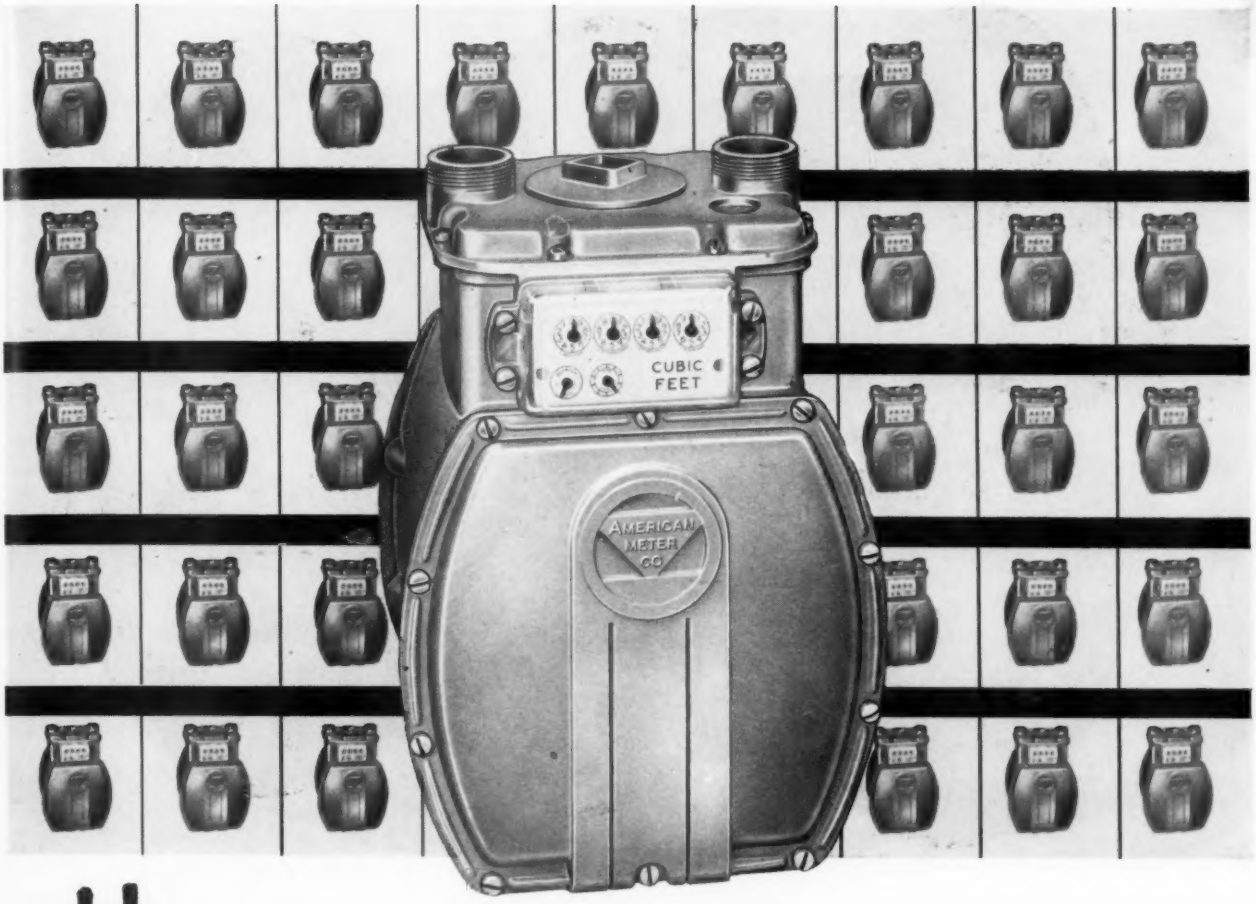

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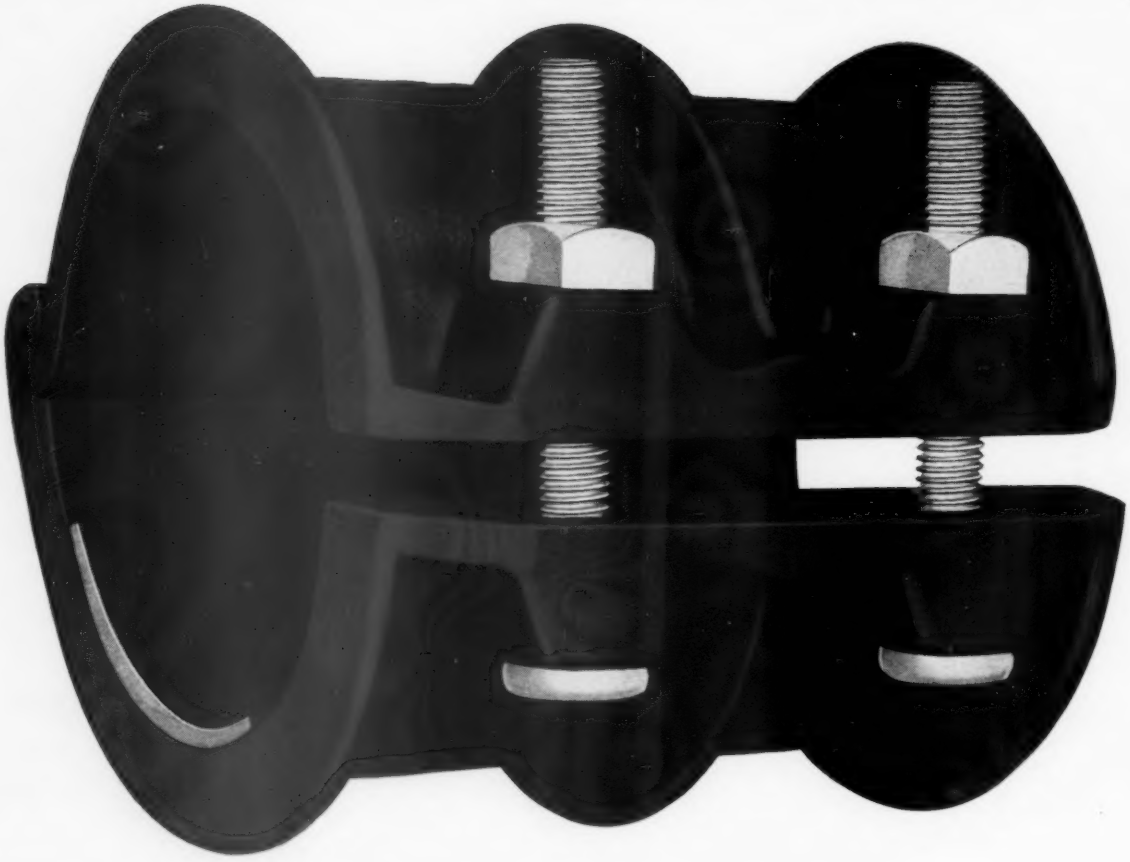

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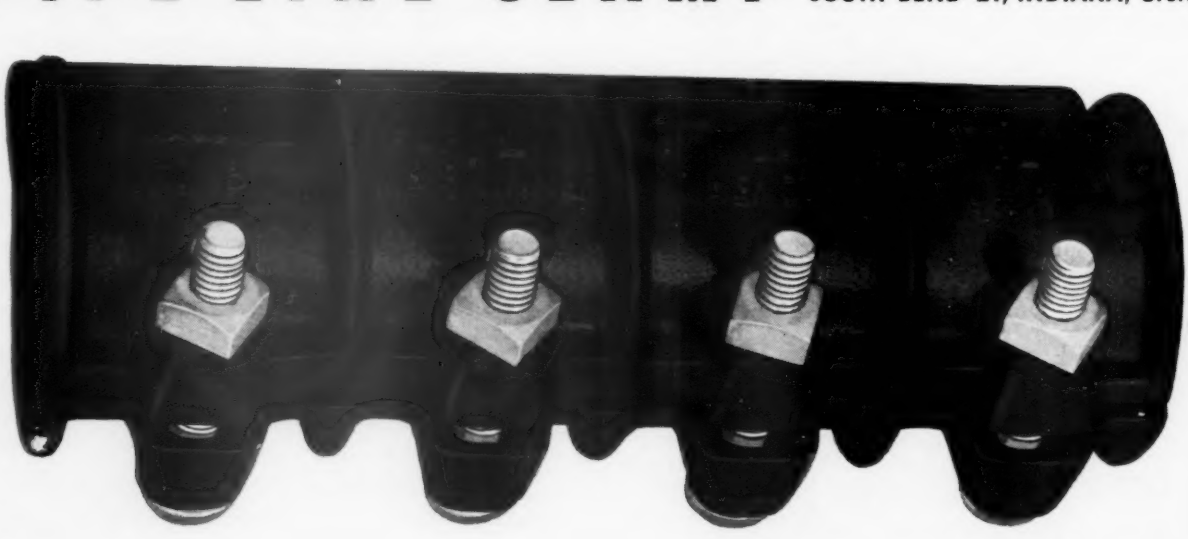
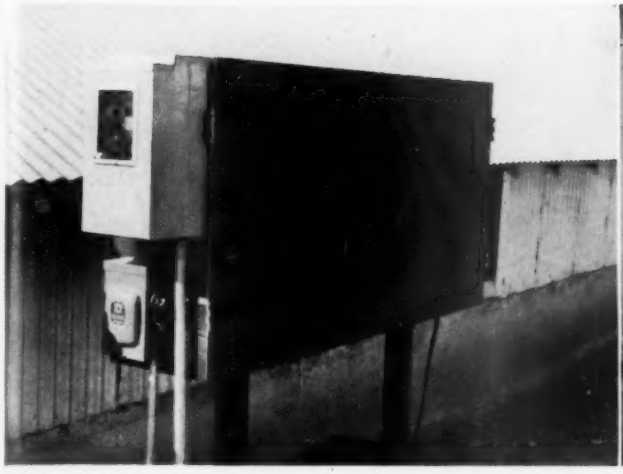
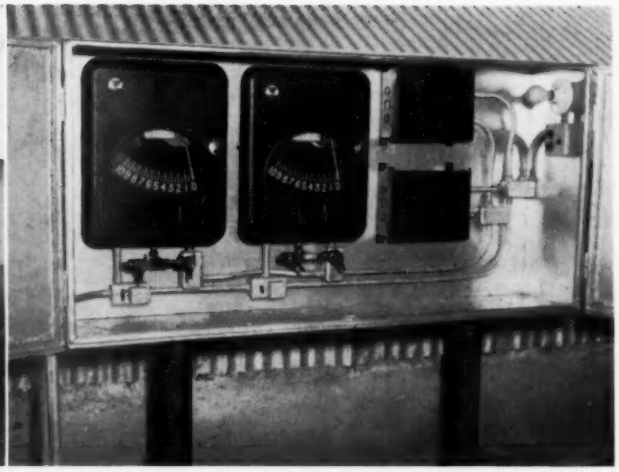




Telemeter transmitter installation located at Bottom Street station.



Arrangement of equipment is shown in interior view of transmitter station.

Simply and safely . . .

Automatic Pressure Booster Control

Raymond Olivier
Assistant Measurement Engineer
Houston Natural Gas Corporation

At Victoria, Texas, Houston Natural Gas Corporation is using completely automatic, unattended controls to maintain pressures on its distribution system — trouble free controls that "think for themselves" under all load conditions

PROSPECT of a cold norther coming to town no longer brings shudders to the service foreman and his assistants at Houston Natural Gas Corporation's Victoria, Texas, plant.

Back in the "old days," a norther meant someone would have to be available in the chill pre-dawn hours to handle manual adjustment of regulators at the three large town border stations supplying Victoria's gas distribution system.

All that has been changed with the installation of a completely automatic and unattended pressure boosting system. The system "thinks for itself" while affording trouble free operation.

Exceptionally cold weather isn't an all-winter worry in the South Texas area where Victoria is located, but cool winter nights and the infrequent northers are problems. Pressure maintenance, especially with manual operation, proved expensive in both time and money.

Growing City Created Problems

Natural gas first came to Victoria in August, 1926. The original distribution system operated on low pressure. As the town grew, smaller mains operating at several pounds pressure with service regulators at each meter proved more economical than extending the low pressure system. Both the "ounce" system and the "pound" system were served by the original town border station, known as Bottom Street station.

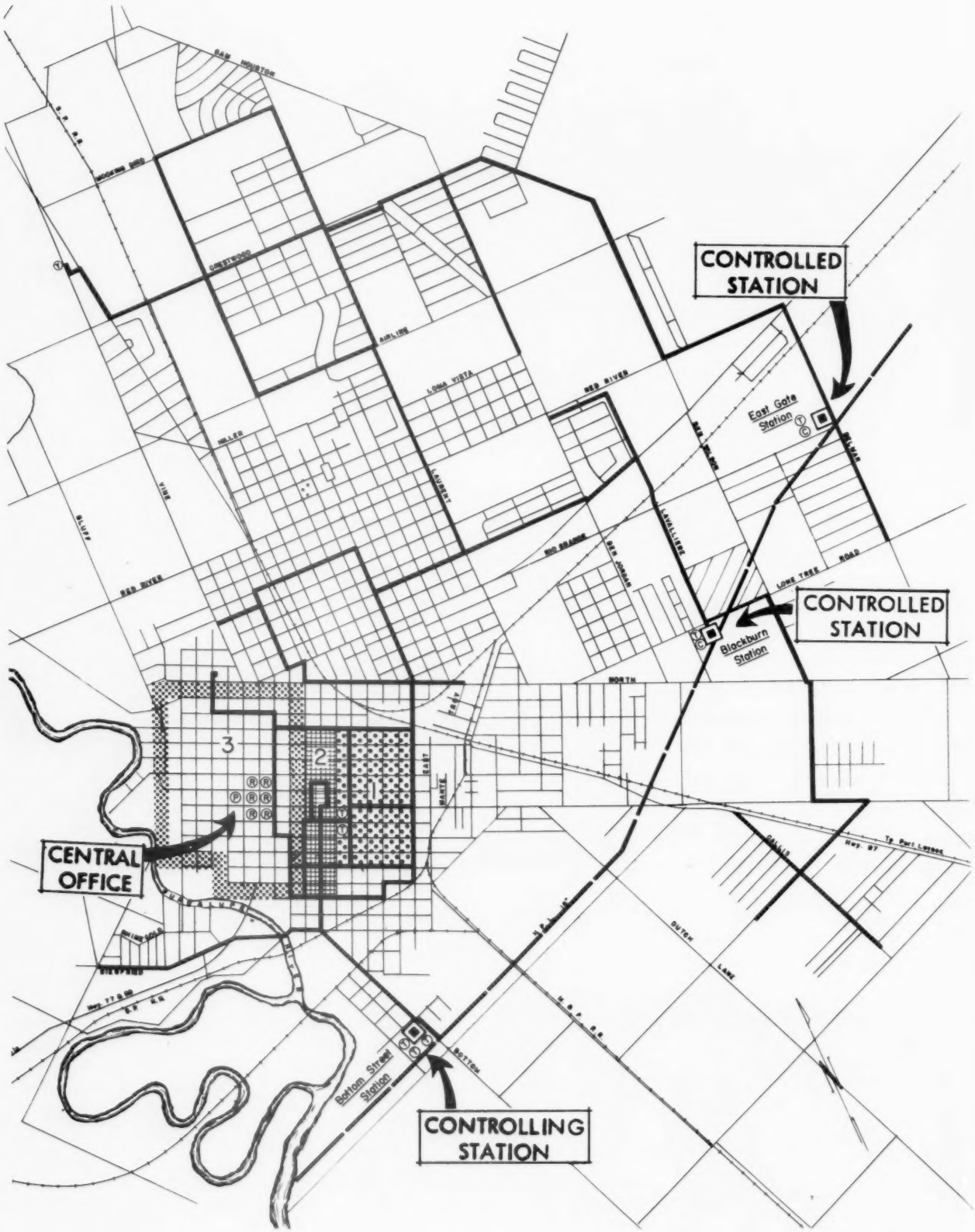
Extensions of the pound system to meet the city's expansion continued until today, it comprises the largest part of the overall distribution system.

High Pressure System Develops

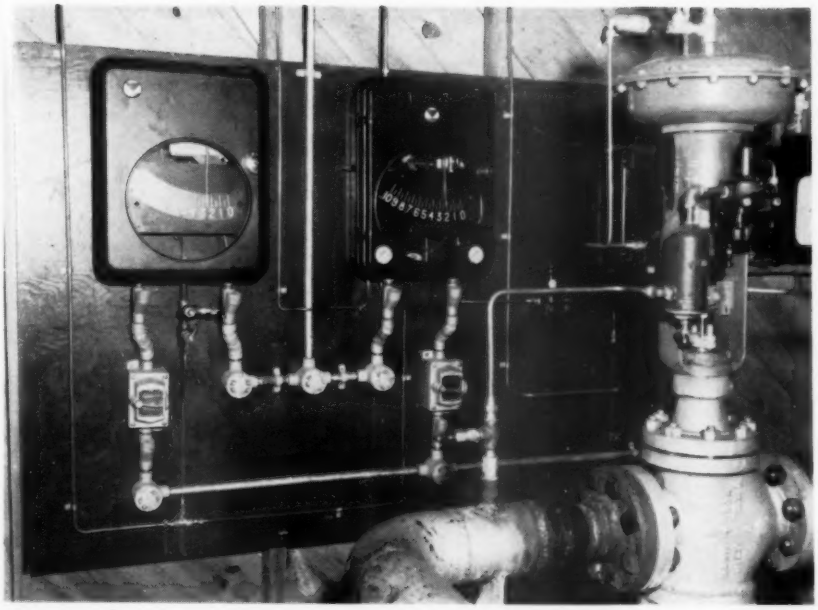
Growing around the outer edges of the low pressure system, the pound system used the high pressure feeder lines going to district regulator stations serving the ounce system. By 1941, Victoria had a total of 2611 meters.

A second town border station became necessary, and Blackburn station was built. By 1953, the city's meters totalled 7400 and a third town border station, East Gate station, was constructed.

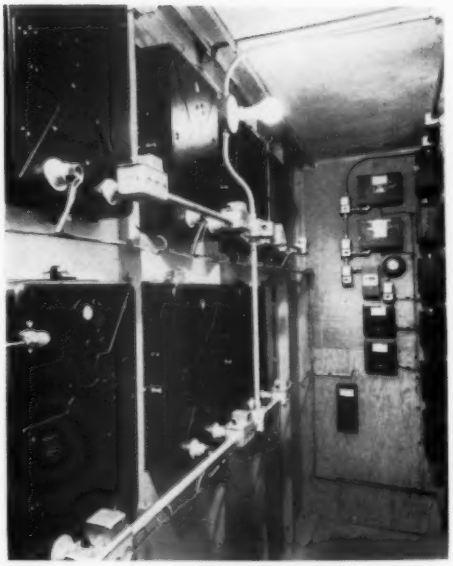
Operation of the pound system is 15 psig minimum and 45 psig maximum, depending on load conditions. All three town border stations receive gas sup-



Location of the three low-pressure systems is indicated on map of Victoria distribution system. Balance of city is served by the large high-pressure system. All three town border stations are indicated, as is the location of the downtown office.

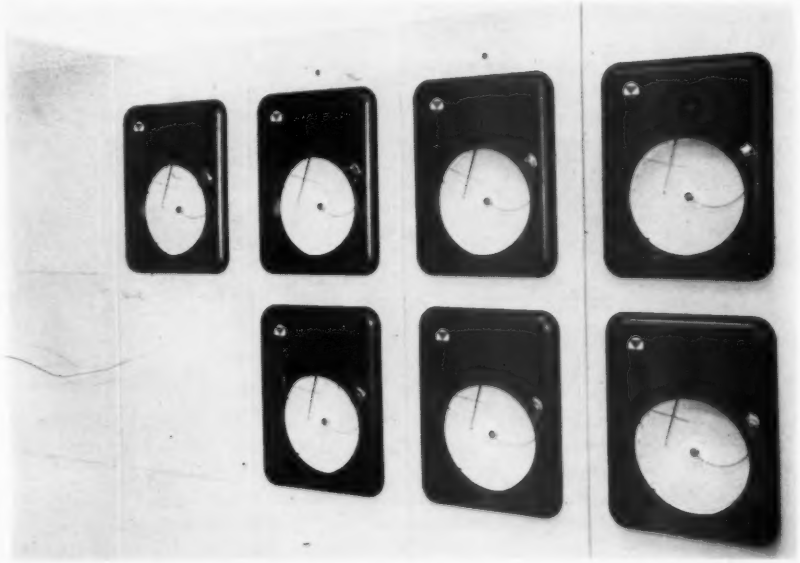


Telemeter and controller installation at downstream delivery station.



Rear view of board shows how equipment is installed.

Panel board with receivers and pressure gage at downtown office.



ply from an 18-in. high pressure line located south of the city.

Changes in Old System

Saturation of the ounce system continued as the city grew, new buildings went up in the area it served, and new types of gas appliances were put into use. In 1948, the north section of the ounce system (Area 3 on the map) was converted to a 4 psig system. By 1952, the south section (Area 1 on the map) was converted to a 2 psig system.

Conventional pilot loaded regulators feed these systems. So far, there has been no need to change the operating pressures. Frequent visits were made to the stations to determine if the pressure on the system is adequate.

Remaining part of the original ounce system (Area 2 on map) had so much variation in pressure that considerable time was spent in manually raising and lowering pressures at district regulator systems to maintain fairly constant pressure on the system.

To solve this problem, a time-temperature booster was installed. This solution proved good — this area is still operating efficiently today.

Operations Become Expensive

As outlined in the above brief history, the city is composed of four systems. Three of these are relatively small and trouble free, compared to the high pressure distribution system.

Of the 8800 meters now served, and a total annual volume of 900,000,000 cu ft of gas, the major part of the city is served by the high pressure system.

On cold days, operation of the three border stations manually, as well as operating the district regulator stations, required several men to be on duty at times from as early as 4:00 a.m. to as late as 10:00 p.m.

This proved to be a double type problem. Manual type operation was expensive. Poor efficiency was experienced in maintaining fairly constant pressures. Time and expense involved in checking pressures on the system were great.

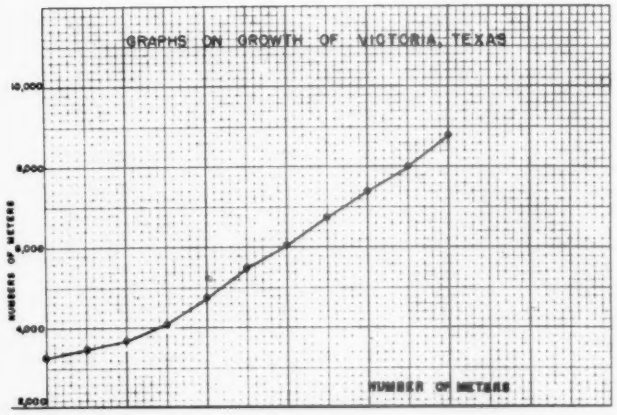
First Step: Telemetering

Needed were centrally located pressure recorders to save time on checking system pressures, and a method of automatically controlling pressures on the high pressure system.

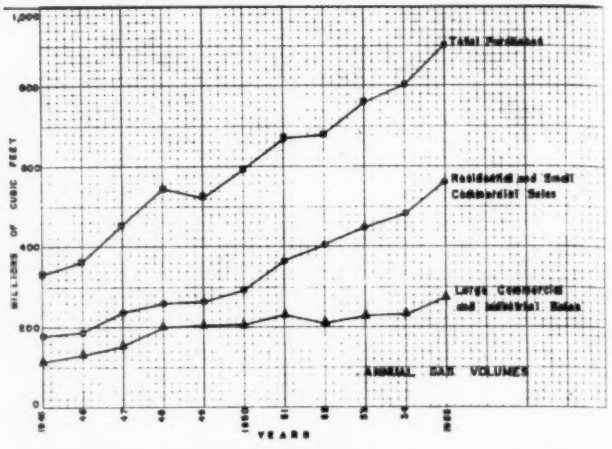
To solve the pressure recording problem, a system of telemetering was installed. This consisted of transmitters, receivers, and a five-section panel board located in the main office.

Main office of the company is in the central section of the 4 psig system. To obtain pressures from this system, only a pressure recorder was necessary.

Two telemeter transmitters were lo-



Growth of Victoria service is reflected in chart of meter installations by years. Increase in customers also means expanding distribution system to handle load.



Annual gas volumes for Victoria also reflect city's growth, as well as gas company's problems in expanding system to meet demands.

cated on Church Street, one transmitting pressure readings from the 2 psig system and the other sending readings from the ounce system.

Transmitters were also placed at each of the town border stations. Final point from which pressure was transmitted was the low point on the high pressure distribution system, located on Vine Street.

Continuous pressure records from the six telemeter transmitters and one pressure recording gage presented a good picture of the operation of each system.

Telephone lines leased from the local telephone company were used for the transmission circuits. A single wire and ground (shown in accompanying illustration) is used on all telemeter circuits.

Then: Pressure Control

Hardest problem to solve was to obtain an automatic device to control pressures on the high pressure system.

A pressure booster was installed at Bottom Street station along with two pressure-controlled regulators, one at Blackburn station and one at East Gate station.

Pressure at Bottom Street automatically adjusted to load conditions, but the two regulators had to be raised and lowered manually, with care taken to set them below the minimum flow of the booster at night.

Using more than one differential type booster to feed a common system is unsatisfactory. Usually, these type regulators will "fight" each other.

Keeping a man on duty 24 hours a day to raise and lower pressures to satisfy load conditions was also unsatisfactory. Needed was an instrument that would operate motor valves in the two eastward stations in coordination with the booster at Bottom Street station. Such an instrument would utilize all three stations to exactly balance pressure in the system to suit the load, so there would never be excessive or deficient pressure on the system.

To meet these needs, a pressure controller using a telemeter receiver unit to position the index set pointer was selected. Basically, this is the same type controller as an electric remote set pressure controller — except that the telemetering receiver unit is used in place of an electric motor, and is actuated by the telemeter transmitter instead of a "raise or lower" switch.

The type of controller with a proportional band and automatic reset is more satisfactory than one with a manual reset, since motor valves are used rather than pilot regulators for flow control.

How It Works

Basically, the system consists of transmitters at Bottom Street station that transmit downstream controlled pressure to each of the eastward stations. This pressure signal is received by the telemeter units in the controllers.

Positioned according to the signal received, the controllers in turn operate the motor valves to maintain equal pressures at each station.

If, for example, the booster in Bottom Street station feels the need to raise the pressure from 15 psig to 25 psig, each of the other stations will automatically raise from 15 psig to 25 psig to keep in step with the booster.

Safety Is Built-in

Safety precautions are built into the system. The d-c power supply was installed at the transmitter along with a 10,000 ohm variable resistor across the mercury switch to maintain a minimum .015-amp on the circuit at all times. This current keeps a sensitive relay, located at the controller, energized, which maintains a-c current on the electric motor of the telemetering unit.

If the a-c power supply fails at either transmitter or controller, or if the leased circuit is broken or shortened, the sensitive relay opens and the controller will not change from its last setting until service is restored.

These precautions stop the controller from changing the set pressures, but do not give the servicemen any indication which controller circuit is out.

Alarm System Included

Additional safety is found in the "hi-lo" pressure alarm signal system installed in conjunction with the automatic pressure control system and telemetering system.

If trouble occurs on the circuits between Bottom Street station and either of the two eastward stations, a bell rings and a light in the downtown office indicates which circuit is out.

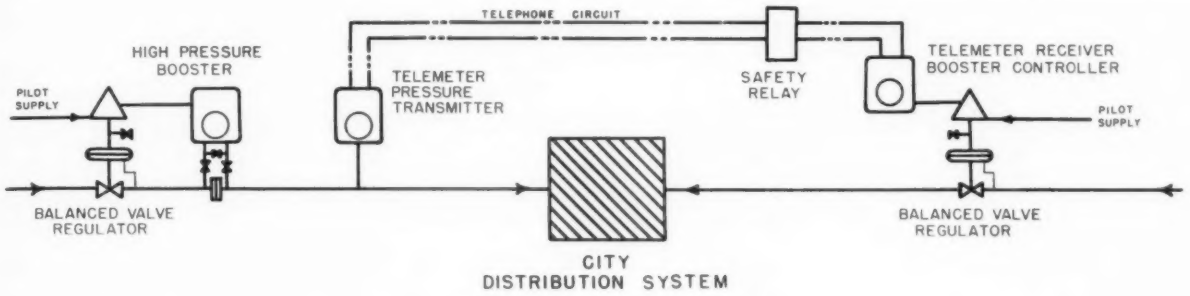
Mercury switches are installed in each of the recording receivers and in the recording pressure gage at the office. If pressures become unsafe, a bell rings to indicate danger. A duplicate bell, installed at the service foreman's residence, rings if pressure trouble occurs anywhere on the various systems during hours that the office is closed.

His bell, though, doesn't tell him where. He must go to the office to determine the source of trouble. A glance at the panel board tells him where the trouble is, and gives him plenty of time to correct it before any harm is done to the system.

System Works Well

To date, no trouble has been encountered with this new system of control. It has worked well during the winter season thus far. Lower pressures are being carried on the system, and unaccounted-for gas is expected to drop.

Here's How Automatic Pressure Boosting Works . . .



Automatic Pressure Boosting with Motor Valves

The schematic above shows two city gate stations interconnected with a leased telephone circuit. Similarly, two regulating stations could be connected. If only one station is involved, no telephone lines are used.

This type installation is automatic and unattended. It is designed to provide stable operation under all operating conditions.

Here's how it works. Let's assume the following conditions:

Minimum pressure desired	15 psi
Maximum pressure desired	30 psi
Minimum differential desired	10-in.
Maximum differential at peak load	90-in.
Boost desired	15 psi

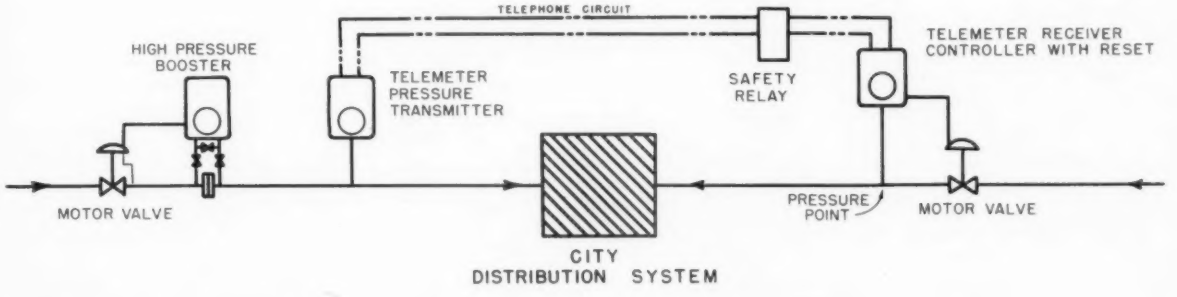
A pilot loaded regulator is used with the high pressure booster. The pilot should be set for the minimum pressure of 15 psi. As differential increases across the orifice plate — which is downstream of the regulator — the booster proportionately increases the pressure to the pilot. The pilot, in turn, loads the diaphragm of the regulator. If demand is at its maximum, the outlet pressure from the station increases to 30 psi.

This line pressure is transmitted by a telemeter transmitter to the other station (or stations) to a telemeter receiver controller with automatic reset. This controller has a static spring with its pressure control point in the delivery line, and automatically controls pressure at this point.

Since the transmitted pressure from the booster actuates the index pointer on this controller, the pressure at this station follows the pressure at the booster. When demand drops, both stations accordingly decrease the pressure proportionately.

The booster station should be set so that it "leads" the other station by approximately 1 psi in outlet pressure. This amount varies in different installations.

Safety relays provide safe pressures in case of telephone circuit disruptions.



Automatic Pressure Boosting with Balanced Valves

When two or more regulating stations are interconnected with telemetering, all stations so connected will automatically increase and decrease pressure on demand. Pressure changes are easily adjusted so that one regulator will not "steal" the load from another, or so that "pumping" will not result.

This type of installation is also automatic and unattended, and provides stable and dependable operation.

Here's how it works. Let's assume the following conditions:

Minimum pressure desired	15 psi
Maximum pressure desired	30 psi
Minimum differential desired	10-in.
Maximum differential at peak load	90-in.
Boost desired	15 psi

In this type of installation, all regulators are pilot loaded. All pilots should be set for the minimum of 15 psi.

As the differential (demand) increases across the orifice plate, the booster proportionately increases the pressure to the pilot. This loads the regulator diaphragm to maximum of 30 psi, but always in proportion to the demand. The reverse is true when demand decreases.

Station outlet pressure is transmitted by telemeter transmitter to a telemeter receiver booster controller located at the other station (or stations). The pressure signal in this installation is transmitted to the measurement pointer on the receiver, which has manual reset only. The output pressure from this controller is proportional to the pressure signal received from the booster station.

In this installation, too, the booster station should be set to "lead" the other station by approximately 1 psi in outlet pressure. Likewise, safety relays provide safe pressures in case telephone circuits are disrupted. * * *

Do it yourself . . .

'Home-Made' Network Calculator Takes Guesswork Out of Planning

B. L. Abbott, *Engineer*
Texas Distribution Division
United Gas Corporation,
Houston, Texas

Time-saving electronic brain cost only $10,000 to build, and has repaid its cost many times over

FOR the past five years, distribution engineers in the Houston adminstrative office of the Texas distribution division of United Gas Corporation have been making quick work of complicated gas flow and pressure problems that once took weeks and often longer to work out.

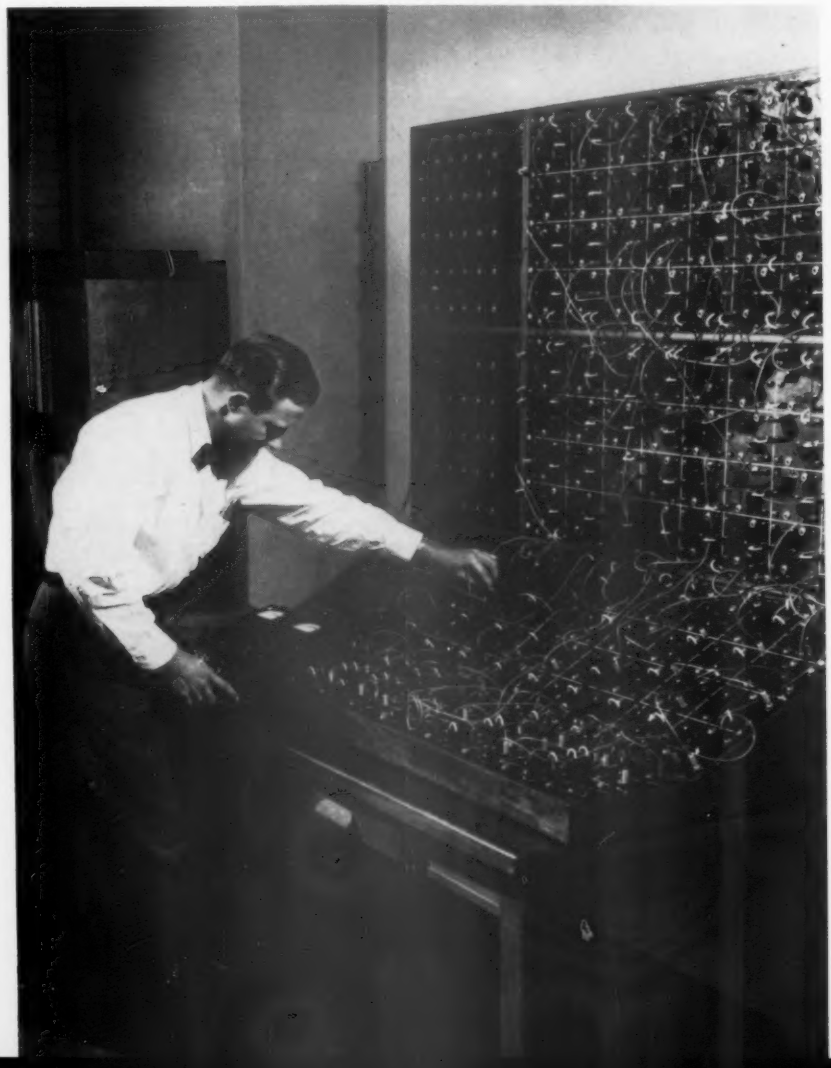
Their time saver is an "electronic brain" that is unusually compact and easy to use, once standard methods are determined, and adequate data provided to make calculations.

Technically known as a network calculator, it was developed and built by members of United Gas Corporation's Texas administrative office engineering department in Houston. It is believed to be one of the first of its kind adapted for use in the gas distribution industry.

The compact, multi-purpose unit, by measuring pressures and volumes of distribution lines in terms of electrical equivalents, can accurately analyze the performance of a natural gas distribution system in a small fraction of the time required by other methods.

With the calculator, United Gas engineers have been tackling problems that previously were considered impractical. Pressure studies that took weeks of tedious calculations and trial and error methods are now made in three to four days.

The author adjusts controls on the board of the network calculator during typical pressure study.



Why An Analyzer?

Necessity is the mother of invention, says an old proverb. Necessity, in this case, was found in the increasing loads being placed on United's distribution systems, often creating problems of pressure variation that are disturbing.

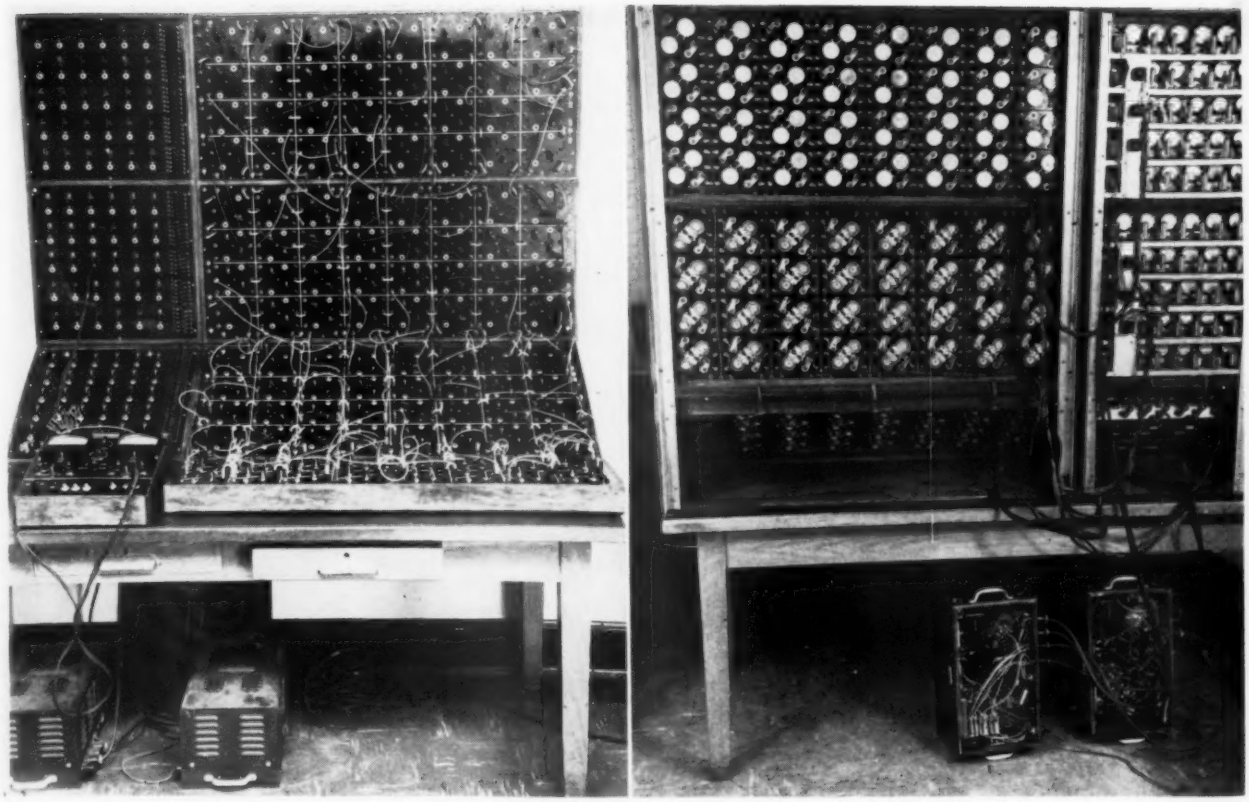
When this occurs, selection of the most efficient and economical methods of replacement or expansion requires the prediction of a system's physical performance under each possible plan of construction. Previously, when a city's distribution system was to be extended to new customers or changed in any way, finding the right combination of pipe sizes and placement of pipe was largely a matter of estimation. Time was not always available to work out mathematically the many possible combinations and arrive at accurate results.

Thus, mathematics, experience, and estimates were often combined to provide answers, with a result that some degree of inaccuracy could sometimes be expected. For example, several miles of 6-in. might be constructed when 4-in. would have done the job.

It's Faster

Today, United's Texas administrative office engineering department has taken the guesswork out of its planning. By using electricity flowing through wires and resistors to simulate gas flow through mains and consumption by customers, the calculator indicates necessary pipe sizes required to maintain pressures, and shows where and how pipe capacity should be increased to give better service.

The engineers, by making simple



Front view, left, of calculator shows line sections on the right side and load panels on the left side. Rear view, right photo, shows sets of resistors through which current flows to correspond to gas flow in distribution mains.

changes in the circuits, can experiment with various combinations of supply sources and pipe sizes and come up with the best answer. The engineers operating the calculator set a goal of 90 per cent accuracy in their work, but results thus far have averaged much higher.

Similar units of the linear type analyzer have been used for well over 30 years to solve distribution and transmission problems of the electrical industry but it is believed that United was among the first to adapt and build its own calculator of this type to apply to natural gas distribution problems. Additionally, there are also a number of non-linear type analyzers in use today by gas utilities.

How It All Began . . .

The story of United's calculator began back in 1950 in the garage of C. L. Woody of United's engineering department in Houston. Woody and other members of the department, working on the idea, studied the d-c network analyzers used in the electrical industry and developed a modified version that would apply to gas distribution problems.

The experimental unit that took form in the garage was built to answer an important question: Would it be feasible under the varied conditions of field operation experienced by United? The systems served by United vary all over the lot — from 125 customers in smaller communities to the larger cities containing as high as 150,000 customers. The unit would have to be usable on all sizes of systems.

As it developed, the unit would be usable under these conditions. For larger distribution systems, calculations are made by breaking the systems into smaller sections and taking them one at a time.

Approximately a year after the project began, the original version of the computer was completed and put in use. The original unit was comprised of a line section panel containing 32 sections and a load panel containing 10 loading devices. The original panels were basically the same as those used today with the exception of some refinements that have been added. The unit has been enlarged several times to meet requirements. The calculator today as a maximum capacity of 224 line sections and 180 load units.

The calculator itself was designed with the idea of simplicity in mind. The fact that the calculator construction and operation is relatively simple facilitates the rapid training of personnel for work on network analysis and stresses the fact that no great amount of electrical background is required to operate it. Personnel of the type normally found around any engineering department or office may be used.

Getting Gas Flow From Electricity

The basic principle of the board's operation is that electrical flow characteristics resemble somewhat those of gas flow. The analogy may be represented in general as follows:

Voltage at source corresponds to the **pressure** at source;

The **voltage difference** due to resistance corresponds to the **pressure drop** due to friction;

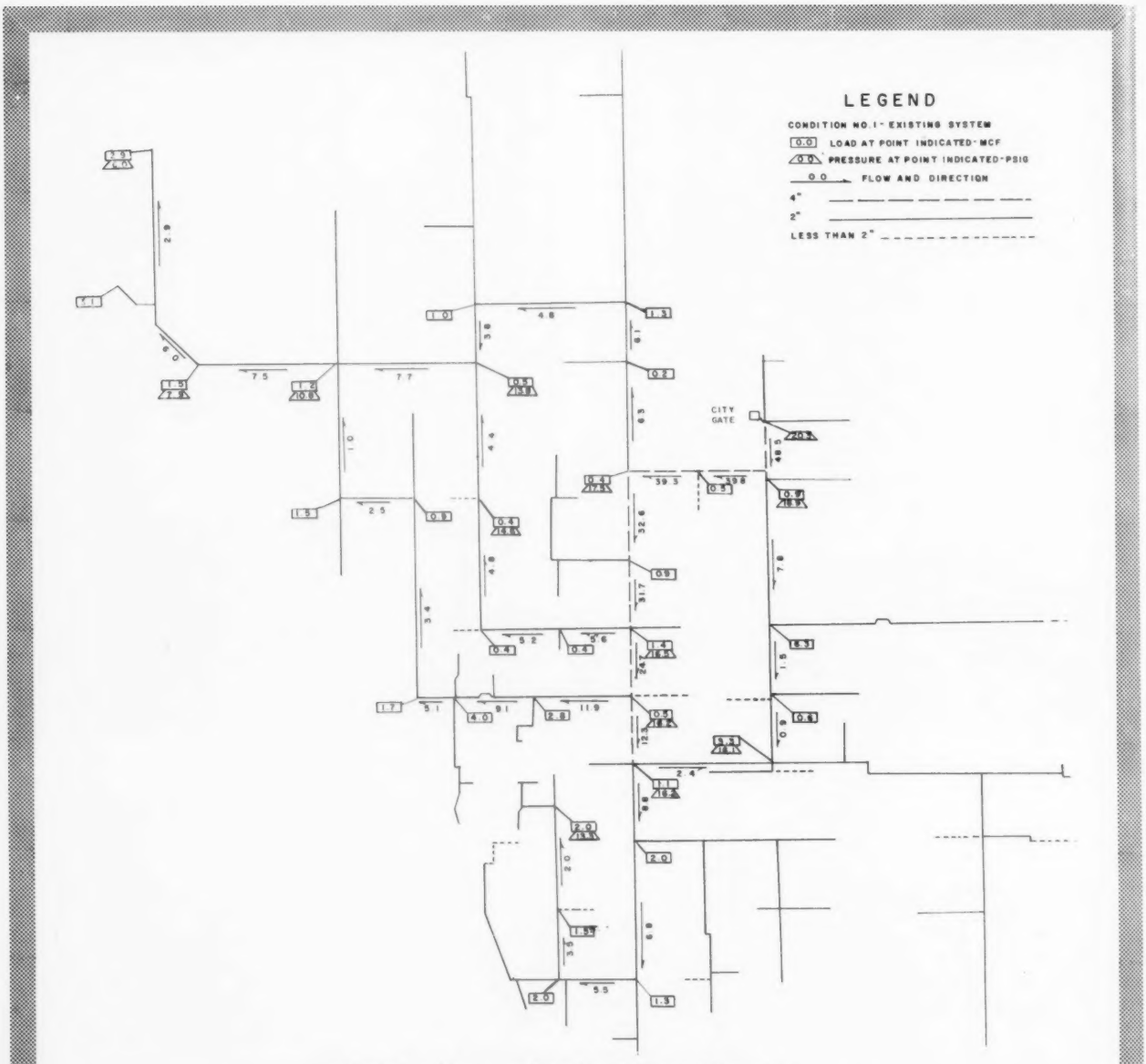
The **current** through resistor corresponds to the **flow of gas** through pipe while,

The **current diverted** by the loading device corresponds to the **gas consumed** by a customer.

The calculator itself is comprised of two principal parts: the **line units** and the **load units.**

The line units represent the sections of main in the distribution system by the use of linear resistors.

Sources of electrical current are



Typical problem — condition No. 1 shows existing system.

The Author

B. L. Abbott is a member of the engineering staff of United Gas Corporation in its Texas distribution division administrative offices at Houston, Texas. He has been with United Gas for 8 years, working primarily in distribution system design. Abbott holds a BS degree in mechanical engineering, having done undergraduate work at the University of Southern California and the University of Texas. He is active in both the American Gas Association and Southern Gas Association.

present on the panels and represent the input points of the system.

The load units represent the take-off points for customer deliveries, and this is accomplished on the board by the use of vacuum tubes in conventional d-c amplifier circuits set to the desired values by a control resistor.

Thus you have the major factors of any distribution system: **supply, a network of mains, and loads of consumers.**

The formula used in the accompanying diagrams to show how measurements are made, is adapted from the Weymouth formula. This formula is:

$$P_u^2 - P_a^2 = Q^2K$$

where:

P_u = Upstream pressure (psi)
P_a = Downstream pressure (psi)
Q = Flow in Mcf per hour

$$K = \frac{\text{Pipe Length in Miles}}{\text{Pipe Constant}} = \frac{L}{K_w}$$

Converting these actual physical values to corresponding electrical terms, the following formula is derived, and terms given:

$$V = A\,R$$

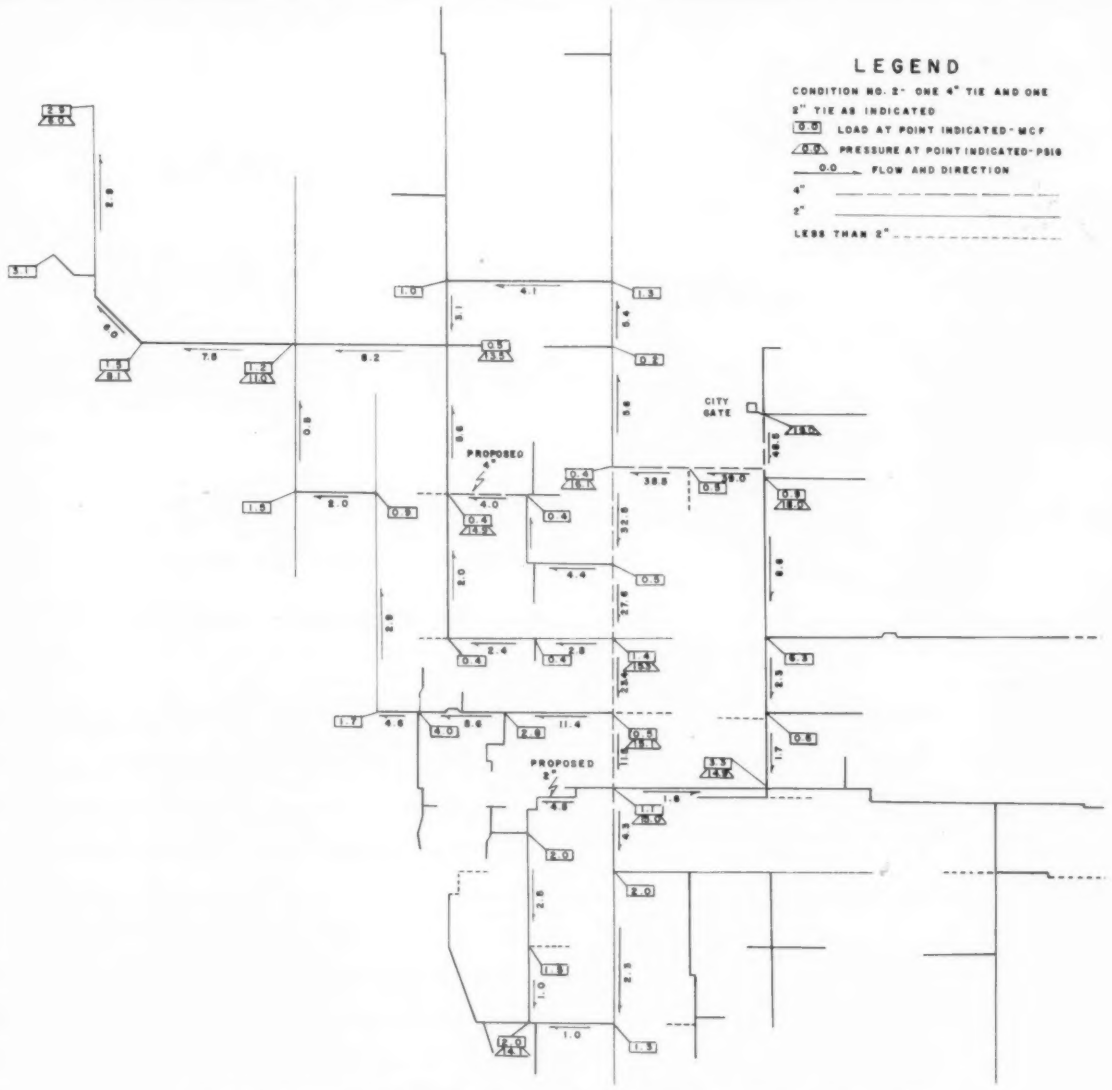
where:

V (in volts) corresponds to $P_u^2 - P_a^2$
A (in amps) corresponds to Q
R (in ohms) corresponds to K or

$$\frac{L}{K_w}$$

Data Must Be Accurate

The transition from the gas industry terminology to that of electrical



Typical problem — condition No. 2 shows new ties proposed to increase system efficiency.

characteristics come about by first constructing a system in its known or desired state and recreating the same conditions electrically on the panels. Thus the data for the physical system must be known and—the accuracy of the network calculator, like so many other computers, must rely on the accuracy of the data furnished for the study.

The size and length of each section of pipe, the flow coefficients for the flow formula used, the load locations and values, the sources of supply, and other such physical properties must be arranged on a work map to start the process.

Each section of the line panel is considered to represent a section of pipe in the physical system. The variable resistors are then set at value representing the physical resistance the pipe offers to gas flow. The vacuum tubes are adjusted to draw a constant value of current as set by the variable resistor on the load panel. These loads are connected to the line sections to represent the customers as they have been grouped in the physical system. All connections of the piping in the field are represented by interconnecting jacks on the panel. The recreated system is then connected to a source of power at the point the gas is introduced into the physical system.

By establishing either the source or the end pressure, the resultant pressure conditions are readily determined. In this respect—the taking of a series of readings—the linear type analyzer is at a slight disadvantage compared to the non-linear type.

It is necessary to take a series of readings and make consequent readjustments of the linear resistors to bring the system into approximate balance because you are solving second degree equations with a linear apparatus. Frequently, however, this series is rather short and does not take any great amount of additional time. Some linear analyzer operators use various and sundry devices to shorten the time and speed up operations. The difference in investment between the two types of analyzers — linear and non-linear — might allow some additional time for a series of readings.

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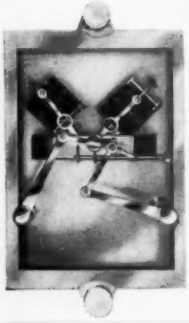

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SU-6

Typical problem — condition No. 3 shows new ties proposed in first alternate to increase efficiency.

Description of the Board

The board is simple in construction as one might imagine with it being a "homemade" project. The unit as a whole is composed of three primary units:

The line sections.

The load units and

The power supply.

All these are coupled as one unit and rests on a table or stand built to accommodate the various units. There are 7 line section panels, each composed of resistors, connecting jacks and metering jacks. The load units are grouped in 6 panels, each complete with vacuum tube, resistor and metering jacks. The power supplies were built along standard lines to furnish the necessary voltages to the various portions of the board.

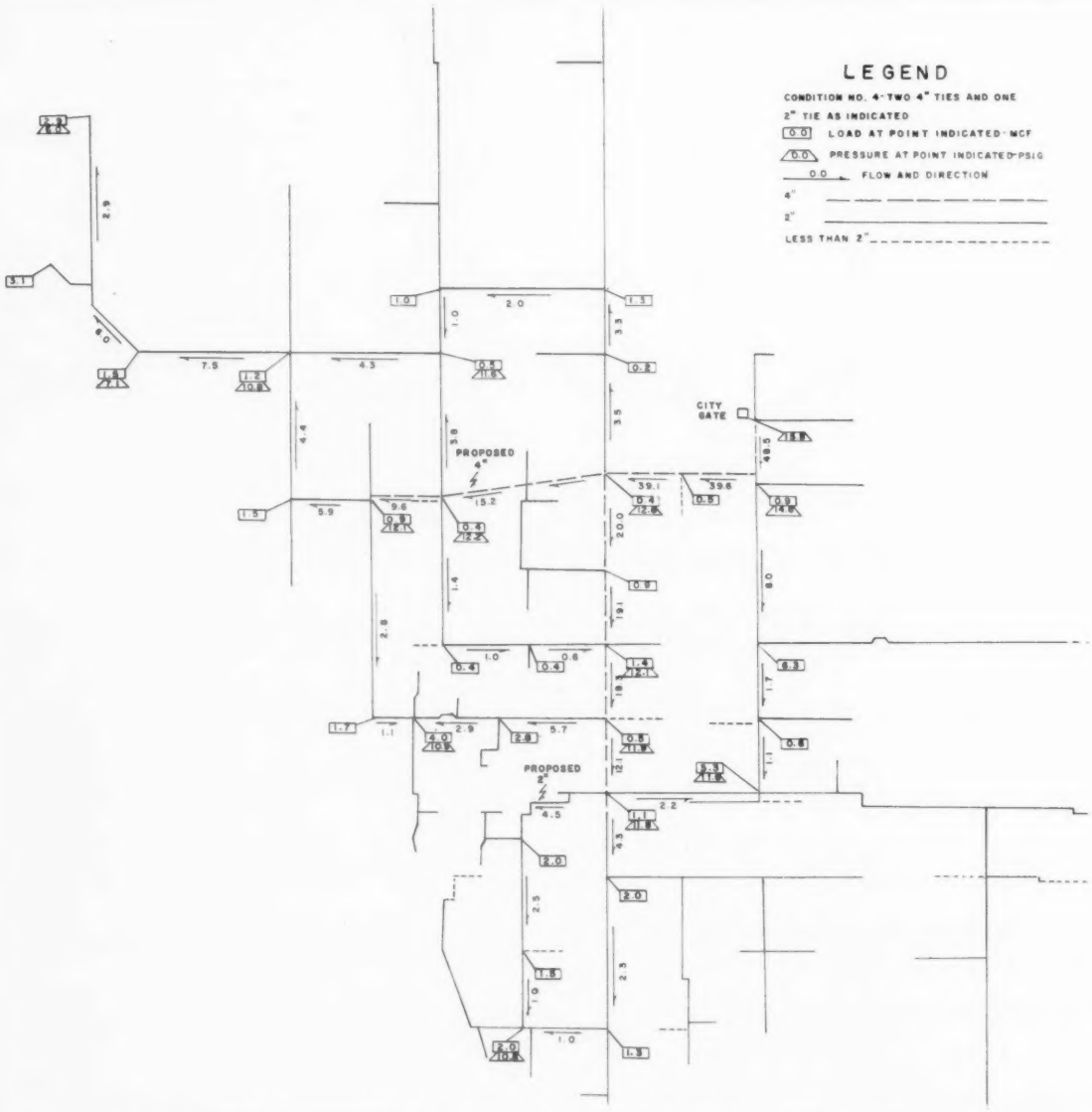
The panels mentioned above are ¼-in. bakelite sheets drilled to accommodate the resistor and jacks for each line section and the load units. These are mounted in plywood cabinets, the lower tier on an angle and the upper tiers in a vertical position. All the panel units are connected behind the board by wires in cable groups. All the parts used in the construction of the board are of standard manufacture and may be purchased at most any electronic supply house.

The metering units are also standard meters adapted for the ranges used on the board. These are also mounted on ¼-in. bakelite panels installed in plywood cabinets or boxes. The meter cabinets rest on two standard metal utility cabinets or tables mounted on casters to provide mobile metering units to move up and down the board front.

Setting Up a Problem

The preparatory work for a "board" problem is no different than for any other method of analysis. All data pertaining to the physical system, such as length and size of mains and their network make-up, must be established and the loads for all the component parts of the system established before proceeding into the problem.

On the larger, more complex systems, a skeleton network encompassing



Typical problem — condition No. 4 shows new ties proposed in second alternate to increase efficiency.

all major loop lines must be established with all lateral lines shown as loads with predetermined pressure requirements on the loop system. The smaller, less complex problems may be worked in their entirety or in the same manner as the larger problems, the method selection resting with the operator.

After the skeleton system has been established, the L/K factors in the formula must be determined. For simplicity in this discussion the K factor will refer to the K in Weymouth's formula in its general form of

$$P_1^2 - P_2^2 = Q^2 L/K$$

The K values for this form of Weymouth formula is determined from the basic equation

$$K = \left(\frac{d^{8/3}}{27.55} \right)^2$$

To speed up the problem, a table of constants for all the formulas commonly used for the most popular sizes of pipe has been established for ready reference. Since the simplified form of the Weymouth formula stated above calls for the term L/K, a second table has been built up for the most commonly used sizes of steel pipe listing lengths from 1 to 2000 ft in miles as well as the L/K factor for each size and length. By reference to tables the L/K factor of the formula for the most common size of pipes may be had quite readily without an undue amount of calculation. Thus, the L/K factor for each section of main in the system has been determined. This procedure in effect establishes the length and size of each main or line section.

Each section of main in the system is then identified with a symbol that corresponds with a section of the board. From this relationship the physical distribution system may be reproduced on the board by wiring the sections together in the same fashion. At the junction of the sections of main are grouped the proportionate share of the customers located along those lines.

To reproduce this on the board, a loading device, which is composed of a potentiometer controlled vacuum tube, is inserted at each junction of line sections on the board. After the network has been established and the loading devices inserted in their proper spots, the system is connected to a source of voltage after the proper

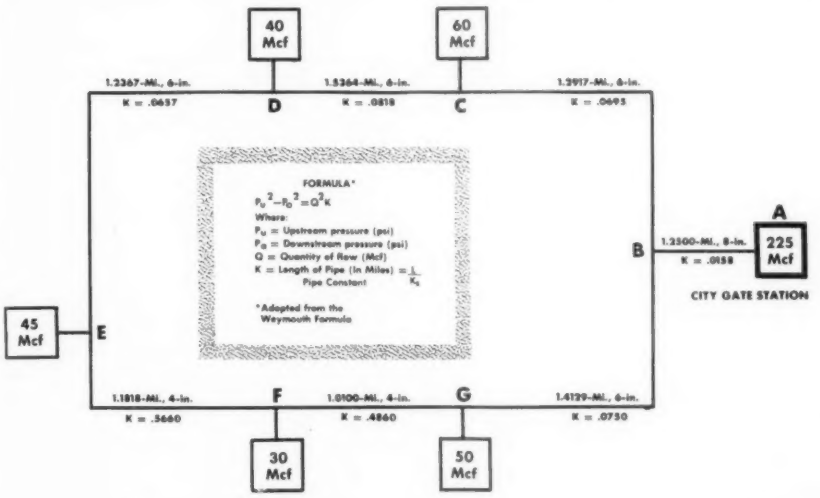


Diagram shows a closed system, divided into sections, with mileage, pipe size and load of each section indicated.

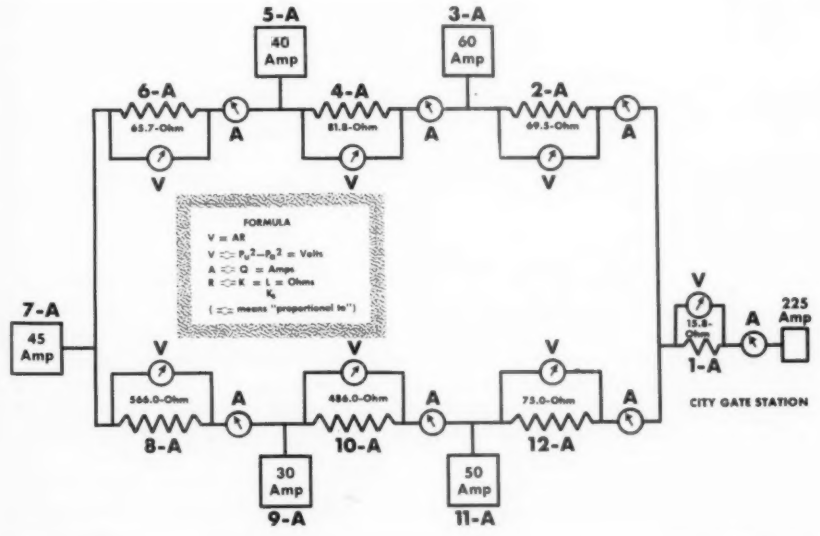


Diagram shows analogous electrical circuit in which voltage, current, and resistance correspond to gas pressure, flow, consumption, and pressure drop.

values have been established for each component part.

Operational Procedure

At this point the operational procedure may vary according to the operator but the two most common methods are:

(1) Assume the flow in each line section to be unity, or

(2) Estimate the actual flow in each line section.

In either case, the estimated flow in each line section is multiplied by the respective L/K factor to provide the setting in ohms for the resistor in each particular line section.

The loads are established by allowing, for example, a mcf consumption to be represented by a milliampere of current. Each loading unit is then adjusted to withdraw the current from the system necessary to represent its respective group of customers in the physical system. By connecting the system to the voltage source, the system is in operation. The actual current flow is metered and recorded for each line section.

This metered flow value usually differs from the original estimated value, so the metered value is multiplied by the L/K factor to provide a new resistance setting for each line section. This new resistance is then set in the board and the procedure repeated until the metered values of flow stabilizes and maintains a fairly constant value. When this point has been reached the voltage drop throughout the system is metered and recorded.

By establishing the pressure at any point in the system, the pressures throughout the system may be determined. The value and direction of flow for each line section and pressures at important points in the system are plotted on a map of the system for visual study. From this study, the weak points as well as the operating characteristics may be observed and possible methods of improving the system devised. These improvements may be tried on the board and the method most suited to operating and economic standards selected.

The discussion here has dealt primarily with the Weymouth formula. Other formulas, however, may be used in conjunction with the board, the main difference being in the treatment of the "K" constant.

Sample Typical Problem

The sample problem enclosed reflects a typical system as it now operates and three possible solutions. Possibly one of the solutions present would be the one selected to meet operational and economic standards or requirements of the company. The solutions shown in this typical problem would not, necessarily, represent the approach used if this were a true system but is used merely for explanation purposes.

In the problem illustrated, it may be assumed the problem is to lower the overall pressure requirement of the system and still maintain 6 psi pressure in the northwest portion of the system. Three solutions were developed.

Condition No. 1 reflects the system, more or less, as it now operates.

Condition No. 2 represents the installation of a block of 4-in. main in the central portion of the system and the installation of a small amount of 2-in. main in the south central portion of the system. These installations improved the overall pressure situation only slightly, although it may provide local reductions.

Condition No. 3 added an additional block of 4-in. main to that installed

in Condition No. 2 and provided no additional relief.

Condition No. 4 added still another block of 4-in. main to that in Condition No. 3 and provided a total reduction in the overall pressure requirement of 4.5 psi, as compared to the present system portrayed in Condition No. 1.

What It Costs

The "home made" pilot model analyzer used by United may not compare in appearance or cost with the more deluxe analyzers sold on the open market. This, however, was a factor that entered into the initial consideration in building the pilot model. The expanded setup, complete with all its accessory equipment, such as additional meters, etc., has cost approximately $10,000. This is but a fraction of what a non-linear type analyzer would cost.

Manpower and time requirements to make the studies are, relatively speaking, low. Four junior engineers spend practically full time on problems involving the use of the calculator—which is in use practically full time.

Working in teams of two, one group sets up a problem on the unit while the other assembles and calculates necessary pipe constants, load data, etc., for other conditions and other towns.

The time required for the various portions of an analysis varies according to the size and type of system and the various changes that are to be studied. A general allocation of time to cover the problems is as follows:

a. Collection of field data such as loads, system alterations, preparation of maps, calculating flow constants, etc., for normal pressure study . . . 40 per cent.

b. Physical preparation of the board and running the original condition of the system and posting data for study . . . 30 per cent.

c. Additional conditions of the system representing various future conditions and alterations . . . 20 per cent.

d. Preparation of report containing maps and data for each condition studied, along with engineering recommendations . . . 10 per cent.

Field data is usually furnished by the field engineering forces or by an administrative office engineer who obtained information during a visit to the field. Much of the preparatory data can be handled by draftsmen and clerical personnel.

Setting up the analyzer is handled by an engineer while the actual operation may be handled by a two-man crew usually composed of an engineer and helper. United, as noted previously, uses junior engineers and engineer trainees, due to the fact that the analyzer is used as a training ground for young engineers in distribution system design. The entire operation, however, could be handled very readily by one engineering personnel and one clerical personnel.

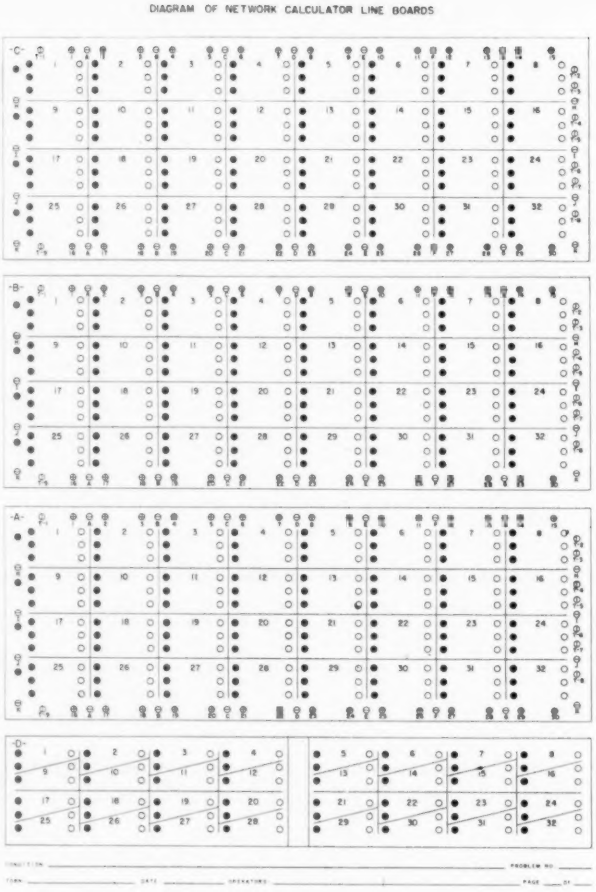


Diagram sheet of calculator line boards is used to set up problem. After plotting on diagrams and checked, the set-up is transferred to the boards.

Analyzer Is Kept Busy

The analyzer has completed, as of September 1, 1956, 70 separate studies covering 60 different systems since 1952. Most of these studies have been of complete systems, while others have been portions of systems too large to be accommodated on the board in their entirety.

Scope of the systems has varied in size from comparatively simple and small systems to rather complicated and large systems. The pressures involved in the studies range from utilization pressure systems with only ounces as a maximum to the high intermediate pressure systems with occasional maximum pressures in excess of 100 psig.

Eventually, a complete analysis will be made of every system of any size in United's Texas distribution properties, which contains approximately 125 towns and communities in addition to the smaller rural communities.

Several of the studies have been checked in the field under conditions closely related to those used in the study and found to be very close to actual operating conditions. Studies have been made of systems that previously had never been observed in their entirety at one time.

How Has It Performed?

In analyzing the results of the use of the network analyzer, the fact that such large studies are now possible and with a relatively low original cost is indeed gratifying.

A prime example was a problem submitted in 1953 on which the usual

NETWORK CALCULATOR — LINE SECTION WORK SHEET

No.	Pipe Size	Length Feet	Length Miles (L)	(1/L) (100)	I_0 Est.	D_0 = (I₀)(1/L) (100)	I_1	$\sqrt{I_0 \cdot I_1}$	D_1 = $\sqrt{I_0 \cdot I_1}$ (1/L)(100)	I_2	D_2 = (I₂)(1/L)(100)	I_3	E	No.
1	8	1750	0.33144	0.366	91.7	1578	45.0	42.3	1548	47.0	1720	42.9	0.74	1
2	6	1950	0.36922	1.073	38.5	7211	41.0	39.8	7465	43.0	8055	39.7	3.2	2
3	6	900	0.17045	0.864	24.3	2100	27.0	25.6	2211	25.0	2160	25.4	0.55	3
4	2	750	0.14205	229.2	10.0	22920	13.0	11.4	25569	11.4	25560	11.7	27.0	4
5	6	1300	0.24621	1.249	19.3	1791	15.1	14.7	1849	14.8	1855	1.37	0.28	5
6	2	1100	0.20833	329.9	9.2	30260	10.1	9.7	31900	9.6	31570	8.6	30.0	6
7	2	1600	0.30303	478.3	0.3	143.0	-0.9	0.35	167.0	0.9	191.0	-0.3	0.05	7
8	2	2200	0.41560	687.6	0.8	550.0	-0.1	0.28	192.0	0.9	619.0	0.6	0.9	8
9	4	600	0.11364											9
	3/4	1260	0.23869	58.99	31.6	1892.0	27.0	29.2	1707.0	29.0	1696.0	30.3	5.3.0	
10														10
11	2	1100	0.20833	328.9	10.0	3289.0	9.5	9.7	3190.0	13.4	4407.0	10.1	17.4	11
12	2	1800	0.34091	538.1	6.0	3229.0	5.5	5.7	3067.0	9.3	5004.0	6.1	2.9.0	12
13	2	1160	0.21970	346.8	6.0	2081.0	8.8	7.3	2532.0	7.4	2566.0	9.7	2.0.0	13
14	2	1580	0.29924	472.4	5.6	2645.0	6.6	6.1	2881.0	6.1	2882.0	5.0	1.6.3	14
15	2	1900	0.35985	568.0	0.5	284.0	0.9	0.95	255.0	0.5	284.0	0.5	0.19	15
16	4	550	0.10417	4.699	1.0	4.7	9.0	3.0	14.1	5.0	23.5	3.8	0.09	16
17	2	600	0.11364	179.4	12.4	2225.0	8.4	10.2	1830.0	11.1	1991.0	9.3	18.5	17
18	2	1040	0.19697	310.9	10.2	3171.0	7.2	8.7	2760.0	9.1	2829.0	7.1	2.0.1	18
19	2	1560	0.29545	466.4	15.3	7136.0	11.6	13.3	6203.0	13.8	6436.0	14.1	8.2.0	19
20	2	1250	0.23674											20
	4	400	0.07576	37.71	12.7	479.9	9.4	10.9	411.0	11.6	437.4.0	11.5	5.1.0	
21	8	1950	0.36922	582.9	12.0	6995.0	-15.6	13.7	7986.0	-16.8	9779.0	-13.2	12.8.0	21
22	2	1000	0.18939	298.9	13.7	4095.0	-17.3	15.4	4602.0	-18.6	5560.0	-14.9	7.1.0	22
23	4	2920	0.5530	249.4	1.0	249	11.6	3.5	87.4	7.4	185.0	5.8	1.1	23
24	4	2410	0.4564	20.59	0.5	10.3						0.5	0.01	24
25	3/4	330	0.0625	13.98	17.3	242.0	23.2	20.0	280.0	22.0	308.0	19.2	5.9	25
26	2	600	0.11364	179.4	9.2	1650.0	11.0	10.0	1794.0	12.0	2153.0	11.1	2.3.9	26
27	2	1250	0.23674	337.7	7.0	2366.0	8.7	7.8	2915.0	9.0	3363.0	8.9	2.6.9	27
28	4	1100	0.20833	9.397	2.9	2060						2.9	4.5.1	28
29	4	9600	0.8712	39.30	18.8	7390						18.8	13.89	29
30	4	5250	0.9943	44.85	15.1	6770						15.1	10.28	30
31	4	360	0.06629	2.99	13.2	39.5	2.6	5.9	17.6	9.3	27.8	8.9	0.27	31
32	4	1800	0.34091	15.4	11.5	177.0	1.7	4.6	7.08	7.1	109.6	6.9	0.85	32

LINE BOARD NO.: A — CONDITION: #1 - PRESENT SYSTEM — PROBLEM NO.: 70

TRACE: HOUSTON, TEX.-CYPRESS & PASTURE — DATE: — OPERATORS: — PAGE: 6 OF 12

Work sheets simplify task of making initial calculations. Line section information is entered in first three columns, then electrical equivalents of flow, consumption, pressure drop are determined. Readings from board are entered as made.

NETWORK CALCULATOR LOADS

No.	I	No.	I	No.	I
1		1		1	3.2
2		2		2	1.8
3		3	2.9	3	4.2
4		4		4	
5		5		5	
6		6		6	4.0
7		7		7	4.0
8		8		8	3.9
9		9		9	5.1
10		10		10	
11		11		11	3.6
12		12		12	4.8
13		13		13	1.8
14		14		14	
15		15		15	
16		16		16	8.1
17		17		17	2.8
18		18		18	2.2
19		19		19	1.9
20		20		20	
21		21		21	2.6
22		22		22	3.1
23		23		23	2.8
24		24		24	3.7
25		25		25	1.7
26		26		26	6.9
27		27		27	
28		28	0.5	28	0.4
29		29		29	1.0
30		30	0.5	30	3.7
			3.9		69.3

69.3
+3.9
TOTAL LOAD: 78.2 MCF — DATE:

LINE DESIGNATION:

CONDITION: #1 - PRESENT SYSTEM — PROBLEM NO.: 70

TRACE: — DATE: — PAGE: — OF:

Work sheet for entering network calculator loads.

planning had been made but was to be checked on the analyzer. It was a problem involving the replacement of a complete utilization pressure system in the downtown or business district of one of the distribution systems.

Several approaches were made to the problem and several solutions presented. The selection of one of the possible solutions was made, weighing both the operational and economic aspects. The solution finally chosen represented quite a change from the previous plan and resulted in a rather substantial saving. In fact, the saving in the cost of pipe alone resulted in the realizing of an economic saving of over $4000.

Thus it can be said the original analyzer unit has definitely paid for itself on the basis of this and other similar problems. Actual savings in materials on other problems are unknown, and the savings realized in lower operating pressures, better system control, and convenience will never be known, figuratively speaking.

The engineers of United's Texas distribution division are satisfied with the accomplishments achieved thus far with the linear type analyzer. They realize its limitations, and as new devices are developed in the field of electronic components, and as non-linear devices are produced at an economic level, the analyzer will continue to experience a gradual but steady program of modification and experimentation.

* * *

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"Our salesmen who call on superintendents of distribution report innumerable cases of highly enthusiastic comment. The personal gratitude towards us for supporting this program is almost embarrassing in its intensity. We have two problems—to sell our products to the industry and to sell the industry to the public. This program is a wonderful example of the American way of doing business."— ***K. G. Merrill, President M. B. Skinner Co.***

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"We are confident of the success of the program and hope to justify further contributions toward its growth."— ***E. C. Hemes, Vice President, Vulcan Rubber Products Inc. Division of Reeves Brothers, Inc.***

"Our participation in this program has been beneficial to our company. It has created a very favorable climate and should benefit us in the long run."— ***Carl N. Brown, Sales Manager, Pipe, United States Pipe and Foundry Co.***

"We are certainly most happy to have had the privilege to participate in this program and will continue to do so."— ***T. J. Moore, A. C. Lawrence Leather Co.***

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Pittsburgh 8, Pa.

Rows of well kept bins in the stores department stockroom provide easy access to materials. A hydraulic elevator lifts heavy items to truck tail gate height for safe, convenient handling.

Communications room where radio and telephone contact is made with men working in the south side area. Area covers about 115 square miles of Chicago.

Offices, Shops and Expanded Without 'Lost

James L. Adkins

Chief Technical Engineer

The Peoples Gas Light and Coke Company, Chicago, Illinois

Desk arrangement for the clerical staff of the service and distribution department helps utilize available space to advantage. Shop switchboard is in background. A luminous ceiling on the second floor provides a bright and cheerful atmosphere.

Exterior of old garage (left), main structure, and new garage building.

NOT one day's work was lost when the South District shop of The Peoples Gas Light and Coke Company, Chicago, was expanded and completely remodeled to provide facilities for greater efficiency and expanding operations.

Originally, shop operations were housed in a one-story office building that adjoined a two-story building containing a storage garage and material storeroom. Built in 1906, the structure had heavy wood trusses, wood floors, and roof. Adjoining it to the west is an automobile repair and service garage.

Since it was necessary to continue all of the operations at the district shop, a number of moves by the various departments were made in order to provide room for the remodeling operations. This shop is assigned the responsibility of serving an area of 115 square miles.

First on the program was to erect, in a parking area to the east of the main building, a 103 ft by 163 ft one-story brick garage. The garage has a bow string truss ceiling with a clear span of 100 ft. This allows easy maneuverability for the various sized vehicles used by Peoples Gas. Windows are of aluminum with glass block in the upper portion.

Two motor operated rolling steel

Hand and power tools of every description, used by street crews and servicemen, are stored neatly on racks in the tool room at the rear of the first floor.

Wash, shower, and locker facilities in the remodeled building are combined in a spacious area on the first floor.

Modernized

Shuffling departments during remodeling of its South District shop pays off for Peoples Gas Light and Coke Company with facilities that provide greater efficiency during expanding operations

Time Problem'

Superintendent of distribution discusses corrosion problem with his assistant. All private offices have steel furniture and new carpeting.

doors on three sides give easy access to the shop yard.

Four electric ventilators are installed on the roof. Heating the garage is accomplished with four gas-fired forced-air unit heaters. Each has a capacity of 5250 cu ft per minute.

Vehicle washing facilities consist of water at two pressures (at city and 300 lb), and compressed air, which is piped completely around the garage with drop lines at every 50 ft so that compressed air and water are within easy reach of any vehicle.

An unloading platform was installed to facilitate loading and unloading of trucks. A levelator permits handling of supplies between the loading platform and the storeroom.

After the new garage was completed, cars and trucks were parked outdoors in an adjacent parking area and storeroom activities were moved temporarily into the new garage. This move vacated the old storage garage and material storeroom of the main building. The storage garage area was remodeled into a new men's locker and washroom and material storeroom. The vacated locker and washroom was converted to a new shop tool store room.

Second floor of the building, which housed the storeroom, was converted into general office and fitters service areas. Prefabricated steel partitions were used to divide the room into private offices and work areas. A completely automatic sprinkler system was installed to insure protection from fire.

Over the entire second floor area a luminous ceiling was installed to provide good lighting, proper distribution of ventilating air, and to hide the overhead truss work and sprinkler piping. All windows in the building were replaced with new awning-type aluminum sash.

After the new offices were completed, the office personnel were moved into the new quarters and the vacated old location was remodeled as part of the material storeroom. The stores department was then moved from the garage building into the new storeroom.

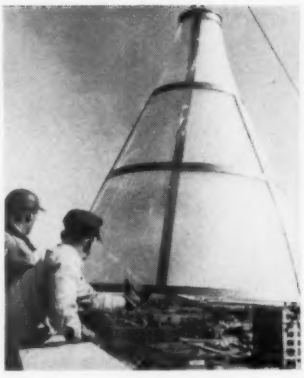
Remodeling of the repair garage provides new facilities for storage of materials and car storage area. The car storage area was enlarged by dismantling an old group of transportation offices that were no longer required. Tire and parts storage rooms were installed on the east side of the building, also a fire proof room was built for the storage of various lubricants. A portion of the second floor at the rear part of the building was removed to provide sufficient vertical height to operate a new pneumatic lift for large trucks.

Facilities of the shop yard were increased to provide for more efficient handling of materials. A railroad spur track was extended to provide larger pipe storage areas and concrete bins were erected to store materials such as sand, stone, black dirt, paving supplies, and scrap.

Thus, by a number of moves between various departments and an extensive remodeling job, an old building was converted into an efficient and pleasant place to work. * * *

Bottom section of the king-sized "gas flame" is swung into place by boom. Inside are 10 white fluorescent tubes, and 82 blue neon tubes. A thermostatically-controlled fan keeps them cool.

Middle segment of "flame" is bolted into place. Two men worked inside, entered through space where last panel will go. The "flame" weighs 6000 lb, is 16 ft tall, nearly 7 ft in diameter.



Leaning over building parapet, two iron workers steady top section of flame on its way up. This section weighs 1800 lb. "Flame" is constructed of ¼-in. plexiglas and stainless steel ribbing.

Final touches are made on the complete assembly. At night, the sign gives appearance of a burning flame and is visible for miles around, a constant reminder that Pioneer is "Providing Fuel for a Growing Empire."

Bunyan-Size Blue Flame

Focuses Attention to Pioneer's New Home

Alton D. Sears

Pioneer Natural Gas Company

GENERAL offices of Pioneer Natural Gas Company in Amarillo, Texas, are now housed in a gleaming, new, seven-story aluminum building that incorporates the latest features for both employee and customer comfort and convenience.

The seven spacious floors and a basement house the operations of a company offering the finest in natural gas service to cities and towns in 27 Texas counties extending from the Dalhart-Amarillo area on the north to the Midland-Odessa area on the south.

Pioneer's three operating subsidiaries . . . Amarillo Oil Company, Pioneer Production Corporation, and Pioneer Gathering System, Inc., also have offices in the new building.

The building is equipped with gas-fired, year 'round air conditioning. Two low-pressure boilers provide steam for heating and hot water, as well as for the operation of two absorption-refrigeration machines with a total capacity of 250 tons . . . sufficient to cool about 80 homes.

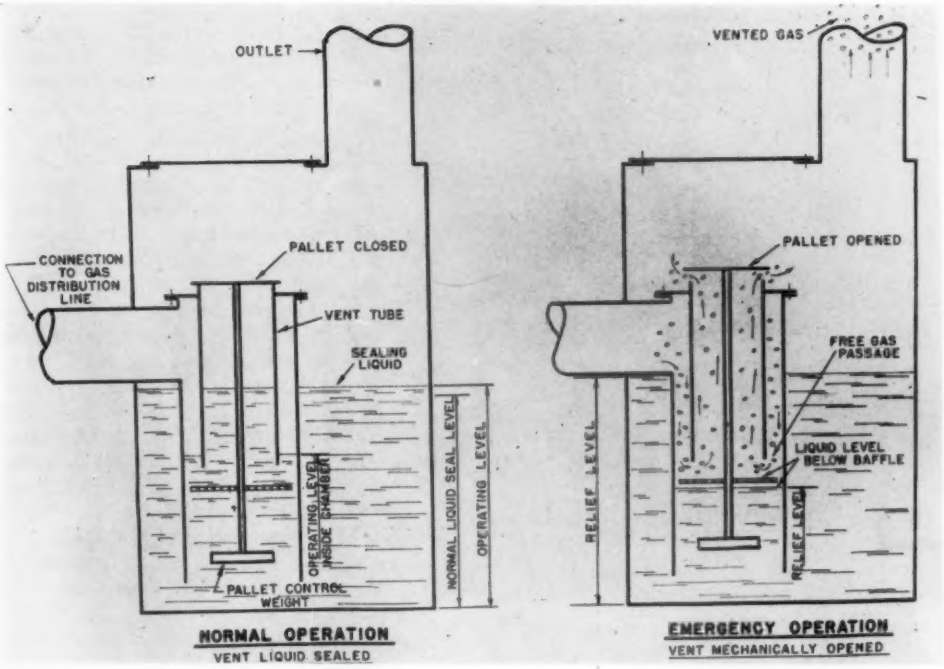
The refrigeration machines furnish chilled water for the various air units located in the offices. The temperature in each office can be individually controlled, making it possible to heat the building on the north side while cooling it on the south side.

Two electronically-controlled passenger elevators automatically select the correct traffic pattern for the service demand. Another modern feature is a hot water coil system embedded in sidewalks around the building to prevent the accumulation of snow and ice in the winter time.

On the ground floor of the attached parking garage, space is provided for customer parking, and a drive-up cashier window on this level makes it possible for customers to pay their gas service bills without leaving their cars. The second floor is utilized for parking company cars, and the third level is for employee parking.

Another stand-out customer feature of the new building is the Flame Room, which combines the best features of an auditorium and a demonstration kitchen. Visitors to the Flame Room may see a lineup of gleaming gas appliances in two ultra-modern model kitchens . . . a built-in range, free-standing range, automatic clothes dryer, hot water heater, and Servel automatic ice-maker refrigerator. Here Pioneer offers the ideal meeting place for social clubs and civic organizations. Also for the convenience of the groups meeting here, the room has a built-in loud speaker system and motion picture screen. ★ ★ ★

Gleaming seven-story, aluminum paneled building forms new home for general offices of Pioneer Natural Gas Company in Amarillo. Topped with a giant 16-ft blue flame sign, the building incorporate the latest features for both employee and customer comfort and convenience.



Simple in design, the device consists of two concentric chambers inserted into a third, which is partially filled with light oil. During normal operations, lower open end of the vent tube is closed by the oil. If pressure in line increases, oil level lowers to a point below the perforated baffle. This allows gas to enter the vent tube, where the weighted pallet lifts to relieve pressure.

Old idea gets new use . . .

Liquid-Sealing, Mechanical-Relief Valve for Overpressure Protection

R. C. Ulm
Manager-Product Research,
Graver Tank & Mfg. Co., Inc.
East Chicago, Indiana

FULL protection against overpressure, without leakage and with a minimum of maintenance, is being accomplished on its vast network of gas mains by Northern Illinois Gas Company through use of a new type of pressure relief valve.

Combining the features of liquid sealing and mechanical relief, the valve, called the *Liquimech* valve by its manufacturer, Graver Tank and Mfg. Co., Inc., is used as a safety device, protecting low pressure gas lines against overpressure buildup.

Consisting simply of two concentric chambers inserted into a third chamber, which is partially filled with a light oil, the unit is 3 ft in diameter and 4½ ft high. The outer inserted chamber, connects to the gas line to be protected. The inner chamber, or vent tube, is suitably dimensioned and contains a baffle and weighted pallet for relieving gas at a predetermined pressure.

During normal operation, the lower end of the vent tube is closed by the oil. If pressure in the line increases, the oil level lowers to a point below the perforated baffle. This allows gas to enter the vent tube and the weighted pallet lifts to relieve the pressure.

The unit can be designed for emergency relief of pressures or vacuums up to approximately 1 psi and can be made in either single or combination units, as circumstances require.

Selection of the valve by Northern Illinois Gas for use on its system came only after extensive testing on its gas mains. The Liquimech valve was originally designed by the Graver Company as an accessory to its expansion roof closed vapor systems for tanks used to store and conserve gasoline. It was developed in the late 1930's to supplant commercially available relief valves that were not tight enough against pressure to keep the system efficient.

Workmen installing one of the liquid-sealing, mechanical-relief valves on Northern Illinois Gas' low pressure system. Recorder unit is attached to relief vent stack above ground level.

Partially assembled units in Graver's East Chicago shops. In foreground are the vent tube and pallet assemblies, which are inserted into the chambers in background.

A simple engineering fact contributed to development of the valve: Liquid sealed valves would remain gastight at operating levels, but during relief would often lose their sealing liquid.

By combining mechanical relief with liquid sealing, the new type valve was developed. The original valve, however, couldn't be designed to flow the required capacities between the small differential relief required (¼-oz per sq in.) and to solve this problem, a movable bell design was introduced.

Adding this feature increased the cost of the unit beyond operational benefits. But, it opened a new field of application — for the gas utilities. Where differences between operating and relief pressures can be greater than 1-in. of water column, the simple liquid-sealing mechanical relief valve finds desirable application.

In applying the valve with its unique operating principle to its operations, Northern Illinois Gas Company in cooperation with the 100-year-old Graver Company has proved that there are still many old ideas that can be used "anew." * * *

Gas Main Goes Deep

Backfill operations are underway to cover a 16-in. main (in a 20-in. casing) lowered and in place in a 40-ft deep trench in Cincinnati. It's one of the deepest jobs ever done there.

In Cincinnati, they do things in a big way — or better yet, they dig deep. One of the deepest gas main installations ever dug by the gas department of Cincinnati Gas & Electric was recently completed. It's a 40-ft deep installation passing under the right-of-way for the city's new Millcreek Expressway.

Extreme depth was necessary. At the point where the gas main crosses Paddock Road and Seymour Avenue, the Expressway also will pass under Paddock Road. The main had to be laid below the future grade of the new superhighway.

Sandy condition of the soil in the area and the accompanying danger of landslide made it necessary to prohibit men from working in the bottom of the trench pit at any time.

All digging was done by mechanical means, operated from outside the sloped trench. The 16-in. main, enclosed in a 20-in. casing, was assembled and welded at ground level and then lowered into the trench.

The author D. K. Ruth (holding phone), demonstrates facets of the telemetering and remote control system for visiting gas industry representatives. **Control console** (left) and cabinet housing telemetering receivers (right) in normal operating positions. Connecting cables are placed in channels under the platform. Console holds all of the relay equipment, power supplies and tone generator equipment. In base of cabinet is a battery good for 4½ hours of emergency service.

David K. Ruth

Chief Communication Engineer
The Manufacturers Light and Heat Company,
Pittsburgh, Pennsylvania

Electronic wonder speeds the distribution of gas as

Automation Comes to Pittsburgh

An unpretentious console and cabinet in one end of the gas dispatching office is spurring even further progress for Manufacturers Light and Heat Company

GAS dispatching never sleeps.

In a wide, cool room on the eighth floor of the Union Trust Building in Pittsburgh, the operations of men and machines and sensitive instruments are integrated skillfully. Their job is to maintain the flow of gas at all times to meet the needs of homes, industries, and commercial establishments throughout the Pittsburgh Group service area of Columbia Gas System, of which Manufacturers is an affiliate.

The machines they use are many. Key among them are telephones, radio, tele-printer, calculator, and air conditioning — the last not a "comfortable extra" but a vital accessory to the operation of the others.

In the past 18 months, a modern electronic marvel has lent even greater speed and efficiency to the gas dispatching operations. The extent to which it has done this has attracted much attention within the gas utility industry. Well-advanced plans for an expansion of the original installation offer ample testimony to the value company officials attach to the system.

Meeting the Challenge

It wasn't always thus. Prior to installation of the remote control equipment, two of three regulator stations affected by the changeover had attended operation.

Each of the two stations had a man on duty on each 8-hour shift. Then there was an extra operator who relieved each of the regular operators during two shifts each week.

To avoid payment of overtime, there was a relief operator for the relief operator — one shift each week at each of the two stations.

The third station had only one shift operation . . . except for occasional extra attendants during the four winter months.

Standard method of operation was for the dispatcher to notify the operator on duty whenever he desired a change in the downstream pressure from any one of the controlled regulators at the station.

Pushbuttons Take Over

With these stations now on automatic control, no attended operation is required.

Control of the downstream pressure is handled by the dispatcher from his office in Pittsburgh. Valuable manpower is released for other duties. The area of human fallibility is diminished and operating costs are greatly reduced.

Total cost of all telemetering and remote control equipment at the regulator stations and in the dispatcher's office was $22,000 — including material and labor. Operating cost for labor per year at the three controlled stations was approximately $33,000. It can thus be seen that one year's labor operating cost is 50 percent more than the total cost of installation of the remote control equipment. Few capital expenditures on the distribution or transmission system show such a wide margin of reduction of expense for the investment.

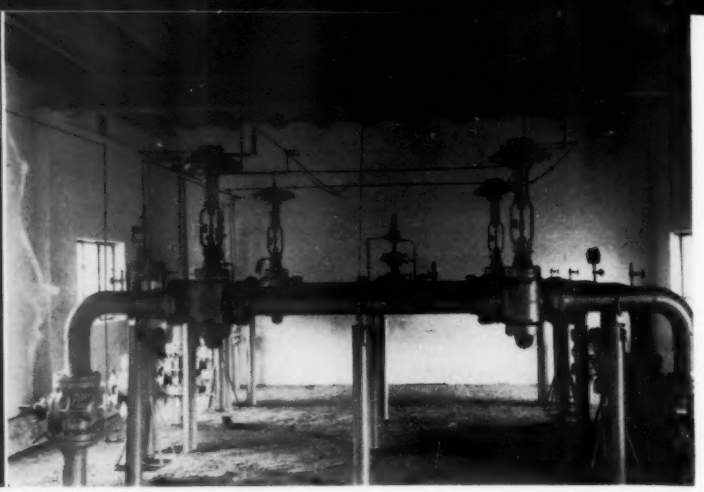
What's Happening . . .

Both *telemetering* and *remote control* are communications terms. In essence, they mean the conveyance or communication of intelligence from one point to another.

Telemetering, as it pertains to our operation, simply means the measurement, in pounds per square inch, of pressure in a gas line at some distant point. The reading at the remote point is converted into electrical energy and transmitted over privately-owned or leased telephone lines to the receiver in the Pittsburgh office. The receiver interprets the energy in original pounds per square inch terms that can be read off a calibrated chart.

Remote control is the control of pressure at some point remote from another point. Desired control is converted to electrical energy and transmitted to the remote point, where it activates a controlling mechanism. In our case, the controlling mechanism is a Bristol pneumatic controller, which is made to raise or lower the downstream pressure on a regulator or open or close gate valves.

All three controlled stations have equipment similar to this — differing only in the number of telemetered or controlled circuits desired. The three transmitters are on left hand section of panels; to the right are the two pneumatic controllers.



Portion of one of the remotely controlled monitored regulator sets. In this picture, the left rear regulator is the one remotely controlled. The other three regulators pictured are provided with conventional monitored controlling devices.

Inside Gas Dispatching, Pittsburgh

Nerve center for the telemetering and remote control operation is in Manufacturers' gas dispatching office in Pittsburgh. It is contained in the compact console-type installation developed by the communications department in conjunction with Westinghouse engineers.

Because of space shortage in the Pittsburgh office, it was not possible to place power supplies, relay panels, tone generators, and auxiliary power equipment in a separate room. (In the controlled stations, the equipment is separated.)

The "custom-built" console-type installation — the first built for the gas industry by Westinghouse—houses the entire transmitting and receiving system in a console and cabinet. They are connected by cables running underneath the platform on which both stand.

Man at the Helm

Standing before the console, the dispatcher is able to observe activity and also originate it in the three stations — two of which are seven miles away; the third is 30 miles distant.

Facing him, on the front of the tall cabinet, are the individual telemetering receivers recording pressures continuously from regulator stations. At present, 10 are in use. Cases for 10 additional receivers are mounted in the two bottom rows—providing room for expansion of the system.

Telemetered pressures are recorded on strip charts that are changed monthly. A control element built into the receivers provides them with high and low pressure alarm limits. A common alarm circuit (covering both telemeters and remote control equipment) provides both aural and visual indication of abnormal operations.

Remote control aspects of the dispatcher's duties are performed by manipulation of the switches, buttons, and lights on the top panel of the control console. Of these, the key switches are seven spring-loaded toggle type, mounted along the lower section of the sloping panel. All remaining lights and switches provide a supervisory and trouble-shooting function.

When the dispatcher wishes to raise the pressure on the downstream side of a particular regulator, he positions the appropriate switch.

This action transmits a coded series of either four direct current or tone pulses over the telephone line. At the regulator end of the line, one relay only will respond to that particular coded series. When the relay receives its coded series of pulses, it closes.

In so doing, it closes the 110-v a-c circuit to the reversible motor on the pneumatic controller. Operation of this motor applies pneumatic pressure to the top of the regulator diaphragm, causing the regulator to open to the desired position.

To lower the pressure, the dispatcher positions the switch in the opposite direction. Another relay responds to this particular series of direct current pulses or tone pulses. This relay operates the motor on the pneumatic controller in the opposite direction, releases diaphragm pressure, and re-positions the regulator to hold a lower outlet pressure.

Arrangement of the circuit is such that, regardless of how long the dispatcher holds the switch in position for a particular function, the circuit will not remain in operation longer than five seconds. To attain a greater change of pressure, the dispatcher must return the switch to neutral position before he can obtain another five-second operation of the motor to produce pressure change. This limiting feature is installed to prevent over-positioning or accidental operation of the facility.

Supervisory Controls

All remaining switches, buttons, and lights on the console control panel provide the dispatcher with a large measure of supervision over operations of the remote control equipment.

He Can, for Example:

. . . Check whether the equipment at the remote end actually did operate according to the way he operated the toggle switch.

. . . Double check (by lights and audible alarm) whether the remote stations have switched to auxiliary power if commercial supplies fail; and know when commercial power is restored.

. . . Double check (again by lights and alarm) whether a telephone line is out of action.

. . . Establish two-way emergency voice contact with maintenance men at the stations.

. . . Find out, if trouble is suspected, whether repairs are needed in the equipment at Pittsburgh or at the stations.

An installation without the auxiliary supervisory controls provided in this installation could be made for considerably less than the $22,000 invested by Manufacturers Light and Heat. Conversely, if more than this minimum of supervisory control were installed — and many additional supervisory controls are offered — then the installation cost would be proportionately higher.

The guiding considerations for Manufacturers Light and Heat have been increased safety and expeditious service. Supervisory controls over and above the minimum requirements of these considerations must be considered as luxury items.

In the final analysis, the extent of supervisory controls built into the system determines ultimate cost. * * *

Scheduling Office Work Prevents 'Pile Ups'

Ernest W. Fair

THERE'S never a day goes by at our office when everything is caught up and finished at the end of the day's work."

"Our biggest headache is that work is always piling up and we never seem to be able to stay even with the staff we have."

Those two statements from two different utility office managers are made almost daily in hundreds of offices of every size and description throughout this land. It's an ever present problem ... an ever-recurrent headache ... solve it in one spot and it pops up in another.

Avoiding work pile ups calls for overall planning of routines, solving the problem by direct attack along the whole line rather than at just one point, and being on constant guard against situations that encourage such pile ups.

In some instances, this situation is caused by a purely personal problem in an individual office, but generally, the situation arises either regularly or at intervals through a combination of one or more of the following situations:

Work Volume is Unequal — This may be due to more active business on one particular day than another, a large percentage of business coming in on one particular mail, or some other similar situation over which there is no direct control.

The ideal method of handling the problem would be to have a fluctuating labor force always large enough to meet the volume at such times but just small enough to handle the business at others. Unfortunately, it is almost impossible to maintain any sort of office staff to handle such situations although firms in some large cities have found a way to handle this to some extent.

The plan they use is equally applicable in smaller communities, too. By careful charting of the regularity of such peak volumes as they occur at various times during the month or day, they arrive at the number of employees over the "permanent staff" that will be required at those specific times. They then recruit these individuals among women who want spare time work but not a regular job. There are a number of housewives and mothers in almost every community with valuable office training and experience who can be secured on such a basis.

Another procedure is to arrive at a leveling between the peak and valley of work volume and maintain an office staff to handle the peak under stress and relax when it passes over.

Still another plan of action is to separate such volume of work on each particular period into

(a) That which requires immediate and urgent action, and

(b) That which can be as well done the next day or two as at the present time.

Better scheduling of routine work often can decrease the height of such peaks in many offices. Doing some work the day ahead and some the day after each peak day can free more hands to tackle the big day's load.

Poor Flow of Material — used in office work has resulted in such stack ups in many, many offices. In small offices particularly far too little attention is given to this factor.

Bad planning, bad scheduling, or a complete lack of either or both can bring this situation about before we know that it has happened. Any time spent by any employee in the office waiting for work to do is wasted time and money. In either case, better attention to making certain that the flow of material to be worked on is set up so that everyone is kept busy will avoid any stack ups anywhere in the office.

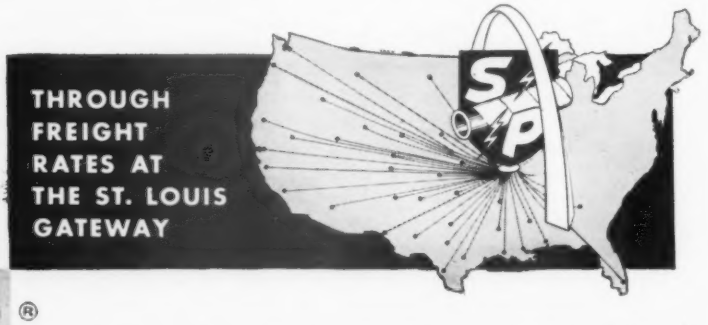
Better Job Assignment — can also help to prevent such stack ups. Strict adherence to set routines and chores by each office employee is seldom good business. The office executive should always be free to shift personnel about in order that a work pile up in one section of the office can receive maximum attention from everyone available.

In some instances, improper placement of individuals in an office can also result in this situation. One girl may be able to work at top speed doing a specific type of secretarial work, for example, where another can turn out only half the volume in the same period of time. Close examination of each such spot where roadblocks in production of work exist will reveal areas where our quickest and most alert staff employees belong. Replacing someone not quite as swift or adept at such a chore and placing her in a spot where speed or adeptness are not required may iron out this kink.

Lack of Essential Information — not being available has often caused such

Everyone at Standard Pipeprotection is skillfully trained for his individual job. And everyone, from president to office boy, is also trained that it is his job to complete your order exactly as you have requested with shipment being made where you want it, when you want it.

As your pipe moves through our plant, your instructions are explicitly followed, for SPI believes that there is no substitute for customer satisfaction.



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work stack ups in even the smallest offices. In almost every instance this has been caused by bad planning on the part of office executives. The most prevalent spot is in dictation, where stenographic work is held up while the office executive searches for some data or information needed for that part of a communication.

Organizing such work before assignment to the individual employee helps avoid these instances. This same good procedure applies to other types of office work also. An extra few minutes spent in organizing any given chore can assure the smooth flow of the work without interruption when it has been assigned.

Avoiding Interruptions — is another good method of doing away with such work pile ups in any office. Visitors who are handled improperly, idle chit-chat, personal telephone calls, errands outside of the office, a sick employee who should be at home resting, laziness, and soldiering all are contributing factors to this particular cause of work stack ups.

When the executive is searching for reasons why this condition exists in his particular office, he should always check into all of these possible causes.

Lack of Standards — is still another contributing factor. In an office without any standards of work production — where everyone is allowed to go his or her merry way — and where there is lax control over work, stack ups are inevitable and probably easiest to avoid.

Discipline is an essential part of our lives from the cradle to the grave and where it becomes lax, we, as humans, will always take advantage of the situation. Where no set standards exist in an office and the situation is coupled with that of lax discipline, work stack ups are as inevitable as the rising of the sun each morning.

Unequal Time Required for Different Parts of the Job — always cause bottlenecks in any office. In such instances, our first attack should be a close examination of how the roadblock section of the job is being handled and a study as to whether or not the system could be revised to cut down this time. It can in many, many cases.

In others, as mentioned before, a shift of personnel may result in reduction of the time required at this particular spot, i.e., putting the fastest and most adept worker at the spot where his or her talents will produce best results.

Each of the foregoing suggestions for attack on work stack ups can be utilized in either small or large offices by the simple procedures presented above. Doing so will result in reduction of overhead costs in every instance as an added asset to the operation. ★ ★

Glossary of Gas Industry Terms—St to Va

Storage Holder: A gas holder for storage of excess gas supply for use during times of excess demand.

Stored Gas, Natural: See: Underground Storage.

Straight Gas Utility: A company that derives at least 95 percent of its operating revenue from gas operations.

Straight Run of Pipe: Several lengths of pipe joined together in a straight line.

Straight Swivel: A meter connection in which all parts are in a straight line.

Strainer: A fine-mesh screen used to separate solid particles from a fluid stream.

Street Ell: An L-shaped pipe fitting threaded on one end and tapped on the other end.

Street Tee: A T-shaped pipe fitting in which one end of the run is connected to the gas main, the other end of the run plugged, and the branch connected to the customer's service line.

Stress: The resultant internal force that resists change in the size or shape of a body acted on by external forces. In the ASA code "stress" is often used as being synonymous with unit stress which is the stress per unit area (psi).

String: A connected series of drilling tools arranged for lowering into the hole. Also, to lay pipe end-to-end along a pipe line right-of-way.

Strip: To remove light hydrocarbon fractions from gas for recovery and sale.

Subatmospheric Pressure: Below atmospheric pressure or a partial vacuum.

Subterranean Storage: Accumulation of oil and gas in porous rocks underground; the bringing of gas during the summer months from distant points and storing it in some anticline near the point of winter consumption.

Sulfur: A chemical element (S), generally yellow in color, that is an impurity in fuels, by itself or as sulfur compounds; with hydrogen and oxygen it forms corrosive sulfuric and sulfurous acids.

Sulfur Dioxide: A gas formed by burning or oxidizing sulfur that is often noticeable at oil wells. It is also used as a refrigerating medium in ice machines and also in some petroleum refining processes.

Sulfureted Hydrogen: Hydrogen sulfide (H_2S).

Summer Valley: The depression that occurs in the summer months in the plot of the daily load of a gas distribution system.

Sump: A hole or low point in a floor or piece of equipment, toward which all liquid will drain.

Superheated Steam: Steam at a higher temperature than the saturated steam temperature at a given pressure.

Superheater: The section of a boiler in which steam is superheated; the section of an oil gas plant in which the gas is fixed; the section for fixing the mixed water gas and oil gas in a carbureted water gas plant.

Suspended Hot Air Heater: A heater through which air is fan-driven and which is hung from the ceiling of the heated space.

Sutherland Law: Expresses the viscosity coefficient of a gas in terms of its absolute temperature.

Sweet Natural Gas: Natural gas containing such small amounts of sulfur compounds that it can be used without purification.

Swing Connection: The combination of a street tee and a street ell that will swing up or down slightly for aligning with surface pipe and absorbing traffic vibrations.

Synthesis Gas: A mixture of CO and H_2, containing small amounts of nitrogen, some carbon dioxide, and various trace impurities. Also called Water Gas.

T

Table: The supporting horizontal shelf for the valves and mechanism in a gas dry meter.

Tack: First attachment of one piece of metal to another by welding in one or more spots.

Tangent and Crank: The connecting link between diaphragms, slide valves and index mechanism in a gas dry meter. A cycle of diaphragms filling and emptying operates through the tangent and crank to move the valves and also to cause the index to move as an indication of the volume of gas passed through the meter.

Tank: A large vessel for storage of fluids, constructed of wood, metal or concrete.

Tank, Gasometer: Tank of the variable capacity type with sliding counterweighted upper sections for maintaining uniform pressure on the enclosed gas. This tank is employed for the storage of gases and vapors, and is also used on oil storage tanks as a "breather" or vent for discharge vapors.

Tank Gages: Used for indicating the contents remaining in tanks.

Tankage: The process of storing liquids in a tank, the capacity of tanks, or the price paid for tank storage of liquids.

Tank Barge: A compartmentized scow or barge for bulk transportation of liquids. May be pushed or towed by a tug or may be self-powered.

Tank Car: A railroad car frame-and-wheel assembly, with a tank mounted on them.

Tanker: A ship designed for carrying liquids in its holds.

Tankstrapper: An individual who gages tanks to determine the volume of liquid they contain or could contain.

Tank Truck: An automotive truck with a tank for liquids mounted on its frame.

Tap: To make an opening in a vessel to drain the contained liquid; also to cut threads in a round hole so that other fittings or equipment can be screwed into the hole.

Tap Hole: A tapped hole in a surface or gas main.

Tar: A black, gummy, viscous by-product of coal- or water-gas manufacture. Used as chemical raw material, road oil, roofing compound and as a fuel.

Tar Extractor: A piece of gas plant equipment for the removal of tar from gas.

Tar Seal: Use of tar as a sealing material around the piston rim of a

waterless gas holder to prevent gas escaping from the holder.

Tar Separator: A baffled flume box or trough that collects tar from the various water liquors in a gas plant.

Tee: A T-shaped pipe fitting having three branches for connecting piping.

Temperature: Basically the degree of heat above absolute zero. A measure of the quantity of heat contained in a substance, and is expressed in degrees Fahrenheit (F) unless otherwise stated.

Tempering: A controlled heating-and-cooling of a substance to produce a desired degree of hardness and toughness. The process is applied to steel tools and parts subject to shock and cutting actions; also, to glass products.

Tempering Bath: A bath of suitable liquid, such as oil, water or molten lead, used to cool steel after being heated to the desired temperature in the tempering process.

Ten-Mile Population Density Index: A number roughly proportional to population density, applicable to a specific 10-mile length of pipeline or main and used in some cases to determine design and/or test requirements.

Tensile Strength: The highest unit tensile stress (referred to the original cross-section) a material can sustain before failure (psi).

Terzian Factor: A factor based on the amount of oil and fuel used and the heating value of gas produced, to compare operating results of carbureted water gas plants. The amount of tar produced is included when heavy oil is used.

Theoretical Air: The chemically-exact volume of air necessary for the complete combustion of a specific amount of a fuel.

Theoretical Draft: The calculated pressure differential between the atmosphere, at standard conditions, and the interior of a furnace with fires burning, disregarding frictional effects.

Theoretical Flame Temperature: Total heat content of initial fuel-air mixture divided by the heat capacity of the combustion products.

Therm: A quantity of heat equal to 100,000 Btu.

Thermal Coefficient of Linear Expansion: The change in a unit-length of a substance for a one degree change in temperature.

Thermal Conductivity: A measure of the rate at which a material will conduct heat. Usually, this is expressed as Btu per hour, per square foot of area, per inch of thickness, per degree F temperature difference between two opposite faces of the material.

Thermal Convection: Heat transfer through a fluid by means of currents in the fluid.

Thermal Efficiency: The ratio of the amount of heat used to the total amount of heat theoretically available from the burning of the fuel.

Thermal Expansion: The volumetric increase of a substance caused by an increase in its temperature.

Thermal Insulation: Materials having a low thermal conductivity used in any location where it is desired to minimize the transfer of heat.

Thermal Radiation: Heat transfer by means of waves, similar to light waves, but of longer wave length, emitted from a hot body.

Thermocouple: Two pieces of dissimilar metal welded or brazed together at one end. When the welded end is at a different temperature from the free ends, an electrical voltage is developed that can be measured across the free ends and that is proportional to the temperature difference and can therefore be used to measure the temperature at the brazed end.

Thermodynamics. The science and study of the relationships between heat and mechanical work.

Thermometer: Any temperature measuring device.

Thermostat: An automatic device that controls the temperature at its location by actuating and stopping the devices that supply fuel to the heating equipment.

Thermo-Syphon Cooling: Cooling of gas or gasoline engine cylinders by the natural circulation set up by temperature differences in the cylinder and radiator without the use of a pump.

Thread: A spiral groove around the inside of a hole or around the outside of a rod or pipe. An inside-threaded piece and an outside-threaded piece can be solidly connected by meshing the ridges and grooves of each with the other, provided each groove has the same shape, depth and pitch as the other.

Thread Protector: A covering device screwed on pipe threads to protect them until pipe is used.

Three-Way Valve: A valve having three ports or openings and built so that fluid can flow through any two of the ports or be shut off entirely.

Throat: See: Venturi Throat.

Throttle: As a noun, essentially a form of valve; as a verb, to restrict the flow of fluid through a passage.

Throttle Valve: A double seat valve used to control steam supplied a steam engine, or fuel to an internal combustion engine.

Through Retort: A horizontal coal gas retort with a door at each end. Coal is charged to the retort at one end and coke discharged at the other end.

Throw: The pressure exerted by a gas holder on the gas at its outlet.

Tie In: To connect additional piping or equipment to existing pipes or equipment.

Tie Rod: A steel rod between two parts of a structure to brace them and hold them together.

Tin Case Dry Meter: Also called a tinned case meter, this is a type of residential and small commercial gas meter in which the mechanism is housed in a case made of tinned steel plates soldered at the joints.

Tin Hat: A protective metal or plastic helmet worn by construction workers, well drilling crews and plant operating personnel.

Toluene: A light oily by-product of coal gas manufacture ($C_6H_5CH_3$).

Ton: A unit of weight equal to 2000 pounds.

Top Lift: The inner section of a water sealed gas holder.

Torch: A portable gas burner connected to a source of gas by a flexible tube, used for heating and, with a long handle, to light large gas burners. May be connected to compressed air or oxygen and used for cutting and welding.

Total Pressure: The sum of the static pressure (pressure of the motionless fluid) and the pressure due to the velocity of a fluid's motion.

Tower Scrubber: A vertical vessel filled with plates or suitable packing over which scrubbing liquid flows while the gas to be scrubbed flows upward through the liquid.

Track Hopper: A fuel hopper beneath railroad tracks into which coal cars are emptied through their dump doors.

Track Scales: Weighing scales in which the platform carries a section of railroad tracks so that railroad cars can be weighed one at a time.

Transmission Company, Gas: A company operating a natural gas transmission pipe line system and receiving none or less than 5 percent of its operating revenues from the operation of gas retail distribution systems owned or managed by the transmission company.

Transmission Main: See: Gas Main.

Transmission System: Pipe lines and equipment for collecting gas from various sources of supply and delivering it to various retail distribution areas.

Trap: A reverse bend device in a pipe line to provide a water seal, such as in waste lines of kitchens and bathrooms; a device for automatically re-

moving moisture from steam or gas; a low spot in a pipe line.

Trap, Gas: See: Separator. A closed steel tank that is provided to receive gas and mixed oil, separate the gas from oil or other liquids, and automatically discharge gas and liquid into separate delivery pipe lines.

Trap Pressure: Pressure held at the trap, or oil and gas separator.

Trapped Piping: A system of piping that has a low spot that collects liquid at a point other than a trap location.

Traveling Crane: A movable mechanical device for lifting and moving heavy loads from one point to another. The crane may move on elevated or ground rails or on its own wheels or tractor treads.

Trench: As a noun, a long narrow ditch in the earth's surface; as a verb, to dig a ditch.

Trenching Machine: A mechanical ditch digger, usually self-propelled, that moves over the ground as it continuously digs a trench, throwing the dirt to one side as it goes.

Trunk, Trunk Main: See: Gas Main.

Tubular Condenser: See: Condenser.

Tubular Goods: A general term for all classes of pipe, tubing and casing used for the drilling and production of oil and gas.

Tunnel Burner: One sealed in the wall of a furnace in which combustion takes place in the refractory tube or tunnel that is part of the burner.

Tunnel Furnace: Long, continuous furnace in which material being heated is pulled or pushed through furnace on cars, conveyors or rails.

Turbo Blower: A blower in which the rotating part is equipped with blades that rotate between stationary blades attached to the housing. The respective sets of blades are set at an angle such that, as the rotor turns, gases are pushed through the blades and discharged from the opposite side, pass through the stationary blades and then are given another push by the next set of rotating blades, finally being discharged from the casing at the opposite end from which they entered.

Turbulence: A condition of fluid flow in which the movement of a given particle of the fluid is constantly changing both in direction and velocity.

Turndown: The ratio of maximum-to-minimum input rates.

Turn-Off: Discontinue gas service to a customer by closing and locking the meter-cock.

Turn-On: Start gas service to a customer by unlocking and opening the meter-cock.

Twin Generators: A carburetor and a generator, of a carbureted water gas set, both converted to high-Btu oil gas production.

Two-Pipe System: A heating system in which the heating medium (steam or water) is supplied to the connected heating units through one pipe and returned to the heat source for reheating through another pipe.

Two-Valve System: A gas-air mixing system using a separate valve to control both gas and air supply. The valves may or may not be interconnected.

U

U-Bend: A U-shaped pipe fitting that connects two runs of pipe with a 180 deg change in direction.

U-Gage: A U-shaped glass tube containing water or mercury and used to measure small pressures or pressure differences. One side of the U is connected to the pressure source and the other side left open or connected to another point in a system. The difference in liquid-level in the two arms of the U is a measure of the difference in pressure between the two sides.

Ultimate Analysis: The percentages of the various chemical elements composing a substance.

Ultimate CO_2: The maximum theoretical percentage of flue gas CO_2 that it is possible to produce from the complete combustion of a fuel with the chemically-correct fuel-air ratio.

Ultimate Strength: The breaking strength of a material.

Ultra-Short Waves, Microwaves: Electro-magnetic waves of greater than 30,000 kilocycles per second frequency or less than 10 meters wave length.

Umpire Analysis: An analysis made by a neutral third party to resolve differences of analysis between contractual parties.

Unaccounted-For Gas: The difference between the amount of gas made and/or bought by a distribution system and the amount of gas sold, used in the system and known to be lost.

Uncarbureted Blue Gas: Manufactured blue (water) gas as it is produced in the generator of the gas plant.

Undecomposed Steam: Steam that has not been broken down into oxygen and hydrogen in passing through the fuel bed of a blue (water) gas generator.

Underground Storage: The storage of gas, natural or LP, in natural underground reservoirs at a different location from which it was originally produced. This is done for more efficient utilization of pipe lines and more economic deliveries to markets.

Underground Vault: A durably-built pit or room, built below ground level, with access through the top or by means of a trench to an opening in the side wall.

Underrated Burner: A burner using gas at less than its designed minimum rate; usually results in gas burning in the mixing chamber of the burner.

Undiluted LP Gas: Liquified petroleum gas that has not been premixed with air.

Union: A pipe fitting used to couple two runs of pipe together without having to turn or dismantle either run of pipe.

Unit Heater: A self-contained heating device having a fuel burner and heat distributing devices as an integral part of the unit. Also called a space heater, heat circulator or room heater.

Universal Joint: A joint in a shaft that permits the rotation of the shaft to be transmitted at an angle.

Universal Motor: An electric motor that can be used on either alternating or direct current, within the motor's design limits.

Universal, Saybolt: A measuring scale of oil viscosity, expressed as the time in seconds for a specific volume of oil to flow through a standardized orifice.

Unsaturated Hydrocarbon: Chemical compounds of carbon and hydrogen in which all the valence bonds of the carbon atoms are not taken up with hydrogen atoms.

Unstable Hydrocarbons: See: Unsaturated hydrocarbon.

Upper Limit of Inflammability: The maximum ratio of fuel-to-air in a mixture that can be ignited. Any greater fuel percentage in the mixture makes it too rich to ignite.

Up-Run: The part of the blue (water) gas production cycle in which steam is blown upwards through the generator.

Up Steam: The steam used in the up-run of a blue gas generator.

V

V: Symbol used for voltage, velocity, specific volume of gas or vanadium, depending upon which subject is under consideration.

Vacuum: A space evacuated of all gases and vapors.

Vacuum Distillation: Distillation at lower than atmospheric pressure and, consequently, lower temperatures.

Vacuum Heating System: A two-pipe steam heating system that is so arranged that it can be operated below atmospheric pressure if desired.

Part 11 of Gas Fundamentals Glossary will appear in a future issue.

COMING EVENTS IN THE GAS UTILITY INDUSTRY

April

2- 4 University of Oklahoma Corrosion Control Short Course, Extension Study Center, Norman, Oklahoma.

8-10 National conference of electric and gas utility accountants, Sheraton-Park Hotel, Washington, D. C.

8-10 GAMA annual meeting, The Greenbrier, White Sulphur Springs, West Virginia.

8-10 ASME, spring meeting, Dinkler-Tutwiler Hotel, Birmingham, Alabama.

8-11 AGA distribution, motor vehicles and corrosion conference, Rice Hotel, Houston, Texas.

12 Southeastern Gas Association, round-table sales conference, Selwyn Hotel, Charlotte, North Carolina.

12 Maryland Utilities Association, annual spring business conference, Lord Baltimore Hotel, Baltimore, Maryland.

14-17 American Home Laundry Manufacturers Association, annual convention, French Lick, Indiana.

16-18 AGA sales conference on industrial and commercial gas, Jung Hotel, New Orleans, Louisiana.

16-18 University of Oklahoma Gas Measurement Short Course, Norman, Oklahoma.

24-25 PCGA-PCEA annual joint spring conference, LaPlaya Hotel, Carmel, California.

24-25 Pacific Coast Gas Association, accounting section, spring conference, LaPlaya Hotel, Carmel, California.

25-26 Indiana Gas Association, annual meeting, French Lick-Sheraton Hotel, French Lick, Indiana.

29-May 1 Southern Gas Association, annual meeting, New Orleans, Louisiana.

May

5- 8 Air Conditioning and Refrigeration Institute, annual meeting, The Homestead, Hot Springs, Virginia.

6- 7 AGA residential gas section, eastern sales conference, Hotel William Penn, Pittsburgh, Pennsylvania.

6-10 National Restaurant Association convention and exposition, Navy Pier, Chicago (AGA will exhibit).

7- 9 AGA research & utilization conference, Cleveland, Ohio.

7-10 Heating, Piping and Air Conditioning Contractors National Association, annual meeting, Hotel Fontainebleau, Miami Beach, Florida.

8-10 Joint AGA-PCGA gas supply, transmission and storage conference, Mark Hopkins Hotel, San Francisco.

10 Southeastern Gas Association, emergency procedure round-table conference, Selwyn Hotel, Charlotte, North Carolina.

12-15 LPGA annual meeting, Conrad Hilton Hotel, Chicago.

19-22 Industrial Heating Equipment Association, Hot Springs, Virginia.

19-23 ASME oil and gas power conference, Kentucky Hotel, Louisville, Kentucky.

20-22 AGA mid-west regional gas sales conference, Edgewater Beach Hotel, Chicago, Illinois.

20-22 AGA chemical, engineering and manufactured gas production conference, Balmoral Hotel, Bal Harbour, Florida.

20-24 National Fire Protection Association, annual meeting, Hotel Statler, Los Angeles.

21-22 AGA industrial and commercial gas section, managing committee, Sea Island, Georgia.

21-23 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pennsylvania.

June

2- 5 American Gear Manufacturers Association, annual meeting, The Homestead, Hot Springs, Virginia.

2- 5 The American Society of Refrigerating Engineers, Hotel Fontainebleau, Miami Beach, Florida.

3 Gas Technology Short Course, North Carolina State College, Raleigh, North Carolina.

3- 5 American Management Association, general management conference, Statler Hotel, New York.

3- 5 Institute of Appliance Manufacturers, Netherland-Hilton Hotel, Cincinnati, Ohio.

4- 6 Appalachian Underground Short Course, West Virginia University, Morgantown, West Virginia.

5- 7 National Warm Air Heating and Air Conditioning Association, The Warm Air Heating Institute of Northern California, The Institute of Heating and Air Conditioning Industries, and Portland Warm Air Heating and Air Conditioning Association, summer convention, Hotel Fairmont, San Francisco, California.

9-13 ASME, semi-annual meeting, Sheraton-Palace Hotel, San Francisco, California.

14 Public Utilities accident prevention conference, Daniel Boone Hotel, Charleston, West Virginia.

16-21 American Society for Testing Materials, Chalfonte-Haddon Hall, Atlantic City, New Jersey.

23-25 Wisconsin Utilities Association, accounting section convention, King's Gateway Hotel, Land O'Lakes, Wisconsin.

24-25 Michigan Gas Association, Grand Hotel, Mackinac Island, Michigan.

24-27 Canadian Gas Association, Jasper Park Lodge, Jasper, Alberta, Canada.

25-28 American Home Economics Association, St. Louis, Missouri. (AGA will exhibit.)

July

8 Gas Technology Short Course, North Carolina State College, Raleigh, North Carolina.

22-26 Western summer radio-television and appliance market, Western Merchandise Mart, San Francisco, California.

August

26-28 Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, West Virginia.

September

3- 5 Pacific Coast Gas Association Convention, San Francisco, California.

4- 5 AGA operating section organization meeting, Sherman Hotel, Chicago.

6 New Jersey Gas Association, annual meeting, Spring Lake, New Jersey.

11-15 National Hotel Exposition, Coliseum, New York. (AGA will exhibit.)

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. . . . with laughing gas

A wise monkey is a monkey who doesn't monkey with another monkey's monkey.

A drunk lying on the barroom floor began to show signs of life so one joker smeared a little limberger cheese on his upper lip. The drunk rose and walked out the door. In a few minutes he returned. Then he left again only to wobble back in soon after. Shaking his head with disgust he said, "it's no use. The whole world stinks!"

What a pity it is that nobody knows how to manage a wife but a bachelor.

Do you know what one dog said to the other dog? "Hurry and sit down — here comes old cold nose!"

Husband, pacing the floor with howling baby, to wife: "Isn't it about time to take him back to the doctor for a thousand-mile check-up?"

The tired clerk had pulled down blanket after blanket until only one was left on the shelf. Then the customer remarked: "I don't really want to buy today. I was looking for a friend."

"Well, Madam," said the clerk, "I'll take down the last one if you think he's in it."

A young man had to rush his wife to the hospital in a terrible hurry. The race was swift, but they didn't quite make it. The baby was born on the lawn outside the hospital.

A short time later the new parents received a bill and among the items was one which read: "Delivery room, $35."

The new father indignantly returned the bill, pointed out the injustice, and demanded an adjustment.

The bill came back promptly and the father was astonished to read the following revision of the disputed item: "Green fee, $35."

Troubled with a sore throat, he rushed to the doctor's home. The doc's pretty blonde wife answered the door.

"Is the doctor in?" he asked hoarsely.

"No, come in," she whispered back.

Often wondered where mothers learned those things they tell their daughters not to do.

Moderate drinking could be a fairly innocent pastime if it weren't for automobiles and women.

To get into television these days, a girl has to know somebody or have some body.

Classified ad: "Cat wanted for light mousework."

1st Hen: "Have you been giving that rooster any special encouragement?"

2nd Hen: "Oh no — I just egg him on a little."

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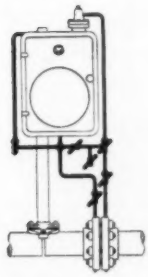

Teflon-packed, forged steel American® Needle Valves stand up in the toughest meter manifold jobs and other corrosive field services without gland leaks. Stainless or carbon steel precision machined valve bodies are specially suited for welding. Stainless steel centerless-ground valve stems are designed so that the valve can be repacked under pressure.

Standard valves design rated for pressures to 5,000 psi at 70°F. For pressures to 10,000 psi, upon request, valves are hydrostatically tested and individually inspected. Valves are furnished with graphite-impregnated asbestos packing for temperatures above 450°F.

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Merchandising News

Robertshaw Demonstrates Range Features for Dealers

A series of demonstration programs aimed at familiarizing retail dealers with the advantages of top burner temperature controls on ranges, is sponsored by Robertshaw-Fulton Controls Company.

More than 150 appliance dealers and their salesmen attended the initial two meetings, conducted by a touring Robertshaw demonstration group in Kansas City, Missouri. Demonstrations were also given in St. Joseph and Joplin, Missouri, and Topeka and Wichita, Kansas. In each city the retailers, with the salemen and their wives, saw a complete dinner — from hors d'oeuvres to chocolate cake and coffee — prepared on range-top cooking units equipped with automatic heat controls.

Miss Rhea Shields, Robertshaw-Fulton home economics director prepared the meal and demonstrated how it is virtually impossible to burn or overcook food on top burners equipped with the new control.

Dixie Introduces Line of 'Budget-Priced Luxury Ranges'

Dixie Products, Inc., Cleveland, Tennessee, has introduced a line of "budget-priced luxury ranges." The nine models of the 1957 Dixiemaster 300 series include many outstanding features.

Most of the new 36-in. ranges have a rotisserie located next to the oven in the space usually devoted to the storage of pots and pans. The spit of the rotisserie is removable making available a second oven for roasting or baking.

The griddle models include conversion grates as standard equipment. All have Oventrol for automatic oven heat control, one Thermal Eye top burner that makes any utensil, even a dime store pot, automatic, the Thrifti-Kool needle type automatic lighters, removable two-piece broiler pan and clocks and timers. Tops of all are of one piece waterfall construction, with two outlets in high backguard.

E. Carl Sorby, vice president of the Geo. D. Roper Corporation, Rockford, Illinois, points up the advantages of the Roper "Bake-Master" oven at the company's annual sales conference. Looking on, left to right, are H. P. Howell, Roper's chairman of the board; C. S. Stackpole, managing director of the American Gas Association; and J. H. Makemson, executive vice president. The range shown in picture is the new "Mrs. America" model for 1957.

Popular Price Range Rotisseries Now Available from Caloric

Caloric Appliance Corporation, Topton, Pennsylvania, has announced the immediate availability of rotisseries in the oven of the Caloric 20, 30, and 36-in. ranges as well as in Caloric's new 1957 built-in oven.

In an effort to effectively combat the sales growth of the portable electric rotisseries, the Roto-Ray barbequer rotisserie was added to Caloric's line in January of 1955. The success and resultant consumer demand for this feature has led to the development of a rotisserie for the popularly priced free standing Caloric range and new built-in oven lines.

Temco Announces Product Changes for 1957 Line

A number of product improvements in its nationally promoted line of gas heating equipment has been made by Temco, Inc. of Nashville, Tennessee. Among major changes is the development of a built-in draft relief on the wall heaters that substantially lowers stack temperatures. The blower attachment on the wall heater, providing more rapid circulation of heated air, is available for both single wall and dual wall models.

A change in the space heater line is use of a diffusion type blower assembly to provide a more even flow of warm air at floor level.

Space Minded Buyers Look To Hardwick's '57 Star Performer

Just because space in a kitchen is limited, there is no reason why cooking shouldn't be out of this world. And Hardwick Gas Range's star — the new space saving 20-in. Rangette — provides top cooking performance though requiring only a minimum of floor space. Although cost and space requirements are less, the rangette, manufactured by Hardwick Stove Company, Cleveland, Tennessee, boasts as beautiful design, heavily insulated oven and skillfully assembled working parts as any of the larger ranges on the market.

Ruud Introduces New Model Gas-Home-Heating Boilers

Improved models of its popular Ruudiator gas-home-heating boiler have been announced by Ruud Manufacturing Company, Kalamazoo, Michigan. Ruud has increased the input ratings of the new models to make them even more efficient for use with all hot water home-heating systems — including those using radiators, convectors, baseboard panels, and floor, wall, or ceiling installations.

Ruudiator Model 1000A has an AGA input rating of 200,000 Btu per hour for use with natural, mixed, and manufactured gases. The same model has raised its former AGA input rating of 150,000 to 180,000 Btu per hour for LP gas. Ruudiator Model 600A likewise has been upgraded in hot water delivery with its former AGA input rating of 112,000 Btu per hour raised to 120,000 Btu for all types of gases.

Herbster 'Heat-N-Dry' Unit Drys Clothes as Heats House

The Herbster Furnace Company, Cleveland, Ohio, has announced major improvements in their line of "Heat-N-Dry" Combination gas furnaces and clothes dryers which make these units more economical to operate than separate units.

The new models, which both provide heat for the home as well as dry the family wash, eliminate any possible heat loss when the clothes dryer alone is operating by automatically shutting off the heat as soon as the clothes drying cycle is completed. Cost studies of the new damper operation show that now much greater fuel savings can be obtained with the Herbster combination unit.

A new timing dial also has been developed which permits more accurate control of the clothes drying cycle. Normal drying time for a full load of wet clothes is approximately 35 minutes.

GCS "OK" Tags Stress Values of Quality Service

To remind its more than 14,000 customers and their employees of the importance of keeping gas burning equipment in proper operating conditions so as to help prevent breakdowns and insure low operating costs, Gas Consumers Service is attaching "OK" Tags to appliances it services. On the "OK" Tags, GCS service men will record the date of the last service call and make recommendations that will keep the equipment in top operating condition. The tags not only emphasize the value of proper service, but help hotel and restaurant employees take proper care of equipment.

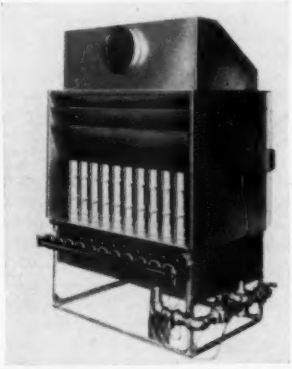
Gas Consumer Service, established 1878, services hotel, restaurant, commercial and industrial equipment in more than 600 communities from 23 branch offices and service centers in all parts of the United States.

Pilot Light

Physicians say that 15 million United States women are overweight. These are round figures.

Payne Introduces New Aluminized Duct Furnace

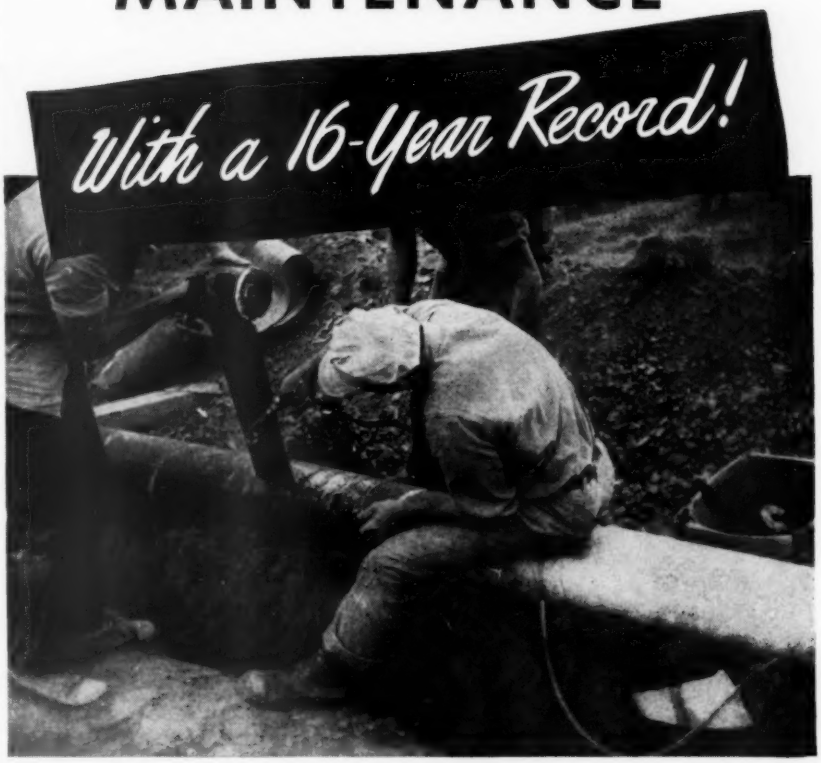
New Aluminized Duct Furnace has been added to present line of forced air, space heating, and air conditioning equipment manufactured by Payne Company of Monrovia, California. The new line is primarily designed for commercial and industrial applications and will be available in four basic sizes, 200,000, 280,000, 360,000 and 440,000 Btu inputs. Featuring an aluminized heat exchanger, the new exchanger material has four times the corrosion resistance of mild steel, based on



average penetration rates and 33 times the corrosion resistance at the maximum penetration rate under identical test conditions.

AGA approved for as low as 50 deg temperature rise through the furnace, (no by-pass needed for ventilation in many cases), the new ADF line can be used in combinations up to 1,760,000 Btu input per hour. Designed at a new low height, only 51-in. plus draft diverter, extreme compactness, and lighter weight cuts handling and installation costs.

PREVENTIVE MAINTENANCE



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Fame, Fortune in Fort Lauderdale, Florida — New Beach Club Hotel where the 49 finalists will stay with their husbands for a week in May while competing in the national finals of the Mrs. America contest.

Mrs. America Cooks With Gas — for the Fourth Year!

Fourth year of gas industry participation in the Mrs. America contest is shaping up into the biggest year yet for this national promotion.

One hundred-fifteen gas companies in 38 states and the District of Columbia have signed up to conduct local and state contests in the search for the next Mrs. America.

Prime sponsor of the Mrs. America promotion, the American Gas Association, is responsible for the running of local and state contests and sharing the task of running the national finals with Mrs. America, Inc. Gas appliance manufacturers who have joined AGA in sponsoring the contest included Gas Range Manufacturers Division of GAMA, John Wood Company, and Servel Inc.

Other co-sponsors include many giants of American industry and solid, reputable firms of staunch reputation such as De Soto Division of Chrysler Corporation, Walter Baker Chocolate Division of General Foods Corporation, Wilson and Company, The Gorham Company, Singer Sewing Machine Company, Emile Bernat & Sons, plus the federal government itself in the form of the U. S. Savings Bond Division of the Treasury Department.

National finals will be held early in May in Fort Lauderdale, Florida. The 49 finalists and their husbands will be housed in a beautiful new hotel on Fort Lauderdale's waterfront—the Beach Club Hotel. The homemaking competitions will be held during three days in Fort Lauderdale's city-owned Memorial Auditorium, and will be open to the public.

During the three days, contestants will take turns cooking, baking, sewing, ironing, and setting a table, and at the same time will be interviewed by a master of ceremonies with a roving microphone. Each contestant's efforts will be carefully evaluated by four home economist judges.

These judges will select from the 49 finalists the six best all-around homemakers. Then three other judges — experts on personality, charm, and stage presence — will select the winner from among these six.

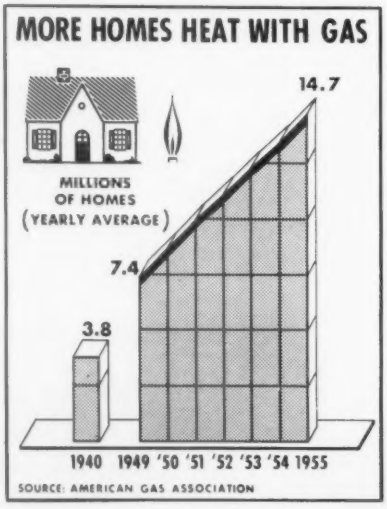
Under this system of judging, the gas industry will be sure of having the most talented, most personable, most attractive homemaker of the 49 final contestants as the new Mrs. America.

Sturkey Heads Association of Washington Utilities

Charles M. Sturkey, president of Washington Natural Gas Company of Seattle, has been re-elected president of the Association of Washington Gas Utilities.

C. Spencer Clark, president of Cascade Natural Gas Corporation with headquarters in Seattle, and Nathan H. Gellert, Jr., president of Spokane Natural Gas Company, have been elected vice presidents. Leland E. Jones of Tacoma, vice president and southern division manager of Washington Natural Gas Company, was re-elected secretary-treasurer.

The Washington Gas Utilities association was formed over a year ago in anticipation of the arrival of natural gas in the Pacific Northwest from the San Juan Basin of New Mexico and the Peace River country of northern British Columbia.



News Notes:

International Symposium on Gas Chromatography will be held at the Kellogg Center for Continuing Education in East Lansing, Michigan, August 28-30 by Analysis Instrumentation Committee of the Instrument Society of America. Discussion will be directed toward theoretical and practical advances in the field of gas chromatography as it applies to both laboratory analysis and industrial process control.

Equitable Gas Company first to offer employees polio shots. First area utility to offer Salk polio vaccine inoculations at cost to its employees was the Equitable Gas Company of Pittsburgh. Shots were administered by Equitable's medical director and nurse in both the Pennsylvania and West Virginia divisions of the company. Total cost to each employee was $2.40 for the series of three inoculations.

Northern Illinois Gas Company will sponsor two four-year college scholarships to be awarded through the National Merit Scholarship Corporation. Scholarships will be awarded to 1957 high school graduates who are residents in the northern Illinois territory served by the gas utility, and who plan to attend any of the 16 Illinois colleges and universities included in the company's program. At least one of the scholarships will be given to a student intending to pursue an engineering course.

Still the largest — For the tenth consecutive year Southern California Gas Company last year added nearly 60,000 new customers to its system to further strengthen its position as the largest natural gas distributing company in the nation. Figures released by F. M. Banks, president and general manager of the utility, show that an additional 58,994 independent active meters were placed in service last year, bringing the total number of customers as of December 1956 to 1,562,930.

Gas in Winnipeg just a "matter of turning the valve." Winnipeg and Central Gas Company expect to have natural gas available in Winnipeg before their deadline of September 1. All arrangements have been made to connect consumers to the natural gas pipeline. Operations are in progress laying pipelines across three river crossings at Miniota, Portage la Prairie, and St. Norbert.

Alberta Gas Trunk Line Company is spending $54 million in gathering and distribution lines to supply gas to Trans-Canada Pipe Lines Ltd. at the Alberta-Saskatchewan border. Construction of system is underway and a crossing has been completed on the Red Deer River. Aerial crossing will be built immediately over the South Saskatchewan River.

Sale of gas appliances has been extremely active in Vancouver, British Columbia, with natural gas now available. Sales of electric water heaters and ranges are down in contrast.

Statistics covering the gas and electric appliance trade show that sales of gas ranges and water heaters recorded a healthy increase over last year. For the period of January to September, 1956, gas range sales totalled 1814 against 1249 for the same period last year.

Natural gas installations are effectively displacing oil in the residential heating field in Vancouver, British Columbia, with the arrival of natural gas. Installations of oil furnaces during 1956 show a decline of 40 percent. During the year, 2596 permits for installations were issued by the Vancouver Fire Department, while in 1955, the permits issued totaled 4346. However, the decline in new home construction partially accounts for the drop.

In honor of H. R. Milner, president of Northwestern from 1932 to 1949, Northwestern Utilities Ltd., Edmonton, Alberta, plans to erect a new 12-story office building in downtown Edmonton, to be known as the Milner Building. Milner remains as chairman of the board of both Northwestern Utilities and its affiliated company, Canadian Utilities, Ltd.

First award winner for the Poster Design division in recent Fifth Annual Local Outdoor Advertising Contest was Commonwealth Natural Gas Corporation of Richmond, Virginia. The contest was sponsored by the Outdoor Advertising Association of America.

Engineers are baffled by the fact that often the girls with the most streamlined shapes offer the most resistance.

Hungry Plant Workers Boost Cooking Equipment Sales

Two good markets for sale of gas fired commercial cooking equipment are the in-plant lunch programs being conducted by large industries remote from commercial restaurants, and the modernization and enlargement of the smaller eating establishments located near large industries.

Fred H. Groen, Jr., chairman of the hotel, restaurant, and commercial gas equipment division of the Gas Appliance Manufacturers Association, reports that industries have become increasingly important buyers of commercial cooking equipment in recent years. America's factory workers will be lunching better than ever before as the many additional in-plant feeding programs are continued and expanded in 1957 as a result of industry's massive building program.

Aware that it isn't good business to be paying $2 an hour at 4 p.m. to somebody who hasn't had a decent meal since 6 o'clock the previous night, employers are turning to in-plant feeding programs. Despite all education to the contrary, breakfast is still a rush-through meal for millions; lunch has to be good, or efficiency suffers.

As the result of these in-plant feeding programs, gas fired broilers, steamers, steam kettles, and deep fat fryers are in heavy demand, and there is emphasis on food warmers that permit items to be prepared and stored long periods in advance of the noon rush.

Money isn't everything. There are other important things such as stocks, bonds, letters of credit, travelers' checks and drafts.

QUALITY CONTROLLED in every step of manufacture . . .

LONE STAR
API LINE PIPE

From mining of raw materials through the finishing operations in Lone Star's ultra modern pipe mills . . Lone Star line pipe quality is controlled every step of the way.

Lone Star Steel is a completely integrated operation . . primarily dedicated to serving the teeming Mid-Continent area. Lone Star, however, furnishes hundreds of miles of line pipe for distant projects such as the great Pacific Northwest pipe line. Lone Star pipe bends readily, wall thickness is uniform, and long lengths and weldability speed up construction.

Neighbor, wherever you are, specify Lone Star and we both get a good deal.

Lone Star STEEL COMPANY

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DISTRICT SALES OFFICES
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Tulsa, Oklahoma | Wichita Falls, Texas | Shreveport, La.

Men At Work IN THE GAS UTILITY INDUSTRY

● **Hall M. Henry** of Lincoln, Massachusetts, has been elected president of the New England Gas and Electric Association Service Corporation to succeed the late **Ralph D. Stauffer. Harding U. Greene** of Concord, Massachusetts, has been elected vice president of the corporation. The new NEGEA Service Corporation president is currently vice president of Cambridge Gas Company and Worcester Gas Light Company and a director of the Algonquin Gas Transmission Company.

H. M. Henry

K. E. Schmidt

● **Karl E. Schmidt** has been appointed chief engineer of the American Natural Gas Company system. He has also been elected vice president and engineer of Michigan Wisconsin Pipe Line Company, American Louisiana Pipe Line Company, and American Natural Gas Service Company. Each of these companies is a subsidiary of American Natural.

● Michigan Consolidated Gas Company of Detroit has announced the retirement of **Charles R. Henderson** as general manager of its Ann Arbor district and the appointment of **Jack D. Hogan** as the new district general manager.

● **E. B. Busby,** formerly residential sales supervisor of the Atlanta office of the Atlanta Gas Light Company, has been named manager of East Point. **Hugh Cuthrell, Jr.,** succeeds Busby. **John Scruggs,** formerly manager of both the East Point and West End offices will now devote his entire time to West End.

● **E. Russell Griffith,** formerly employed by the American Gas Association, has joined Texas Gas Transmission Corporation of Owensboro, as a research engineer. He will work on long-range planning problems important to the growth of the Texas Gas system.

E. R. Griffith

Bruce Kinney

● **Bruce Kinney** has been appointed sales manager for the northwestern New Mexico district of Southern Union Gas Company.

● **John B. Olsson** has been promoted to manager of the commercial department of Brooklyn Union Gas Company.

● **Carolyn Byron,** home economist, has been appointed home service director for Cascade Natural Gas Corporation. She will conduct an educational program on the use of gas appliances and the advantages of natural gas in home making throughout the territory served by Cascade.

Carolyn Byron

P. F. Toman

● **Phil F. Toman** has been named vice president, sales, for Cascade Natural Gas Corporation. He was formerly general sales manager of the company.

● **Robert T. McCrum,** supervisor of commercial promotion, Equitable Gas Company, has been elected vice president of the Pittsburgh Purveyors Association. The Purveyors Association caters to the needs of the food service operators of the Greater Pittsburgh area.

● **O. Marshall Jones,** Seattle business executive, and **Edward A. Osborn** have been appointed vice president finance, and controller of Cascade Natural Gas Corporation, Seattle, respectively.

O. M. Jones

E. W. Corrin

● **E. Wayne Corrin** has been elected a director of Consolidated Natural Gas Company. President of two of Consolidated's subsidiaries, Hope Natural Gas Company of Clarksburg, West Virginia, and The River Gas Company of Marietta, Ohio, Corrin fills a vacancy in the board resulting from an increase in board membership from 11 to 12.

● **Len C. Jarvis,** superintendent of gas production, British Columbia Electric Company, has been re-elected president of the British Columbia Safety Council, Vancouver, British Columbia.

● **Palmer Y. Epler** has been appointed assistant treasurer and assistant secretary of Rockland Light and Power Company, Nyack, New York.

● **Daniel C. Gillespie** is now in charge of the methods department and the central billing department of Columbia Gas Service Corporation in Columbus, Ohio. He succeeds **R. J. Farley,** who has been elected secretary and treasurer of The Preston Oil Company and a member of Preston's board of directors.

● **Lester G. Brailey** has been named personnel director of The East Ohio Gas Company. Brailey, former assistant personnel director, succeeds **Daniel E. Maloney** who retired after 39 years with the company.

L. G. Brailey

A. T. Hemp, Jr.

● **Albert T. Hemp, Jr.** has been appointed gas measurement accounting head of New York State Natural Gas Corporation.

● **Harold E. Vaughan,** formerly with Continental Oil Company, has been named assistant to the vice president for gas supply, Transcontinental Gas Pipe Line Corporation of Houston.

H. E. Vaughan

Neal Stephenson

● **Neal Stephenson** has been appointed manager of customer service for Lone Star Gas Company's Dallas division of distribution.

● **Donald A. Robertson,** controller and assistant secretary, Panhandle Eastern Pipe Line Company, Kansas City, Missouri, has been the general chairman of the committee in charge of the Joint Midwest-Southern Conference of the Controllers Institute of America, held March 31-April 2 in Kansas City.

Thomas S. Lever

Thomas S. Lever, formerly vice president of the United Gas Improvement Company and general manager of the Philadelphia Gas Works Division, died recently at his home in Philadelphia. He was 68. He had devoted more than half a century to the operations of the Philadelphia Gas Works prior to his retirement in 1955.

Ralph D. Stauffer

Ralph D. Stauffer, president, director and chief engineer of the NEGEA Service Corporation and chief engineer of New England Gas and Electric Association subsidiary companies, died recently in Cambridge. He had been associated with the electric and gas utility business for more than 30 years.

● **Dr. Clyde Williams,** president of Battelle Memorial Institute, Columbus, Ohio announced today that the board of trustees has appointed **Dr. B. D. Thomas** as the institute's new director. In this position, he succeeds Dr. Williams in the management of Battelle's extensive research operations in the U.S. and Europe.

Dr. B. D. Thomas

Christy Payne, Jr.

● **Christy Payne, Jr.,** vice president of The Peoples Natural Gas Company, has been elected president of the Pennsylvania Natural Gas Men's Association. He succeeds **Fred W. Batten,** who was vice president and general manager of Manufacturers Light & Heat Company until recently, when he went to the New York offices of Columbia Gas Service Corporation as vice president. **J. G. Montgomery, Jr.,** president of United Natural Gas Company, Oil City, Pennsylvania, was elected vice president of the Gas Men's Association. **P. L. Kesel,** secretary and treasurer of Carnegie Natural Gas Company, Pittsburgh, was re-elected secretary and treasurer of the organization.

● **John W. Tomlinson** has been appointed vice president-engineering of Northern Ontario Natural Gas Company, Ltd., Toronto, Ontario.

J. W. Tomlinson

P. E. Beech

● **Paul E. Beech** has been appointed dealer relations manager of The Peoples Natural Gas Company of Pittsburgh. He was formerly director of employee training in Peoples' personnel department.

● **William R. Stevens** has been promoted to the newly-created position of vice president in charge of operations for The Berkshire Gas Company of Pittsfield, Massachusetts.

● **Oscar T. Leverenz** has been elected secretary-treasurer of Republic Natural Gas Company of Dallas. He was formerly associated with the accounting firm of Arthur Andersen and Company.

● **Walter (Walt) E. Nichols,** manager of gas operations at Northern Indiana Public Service Company, retired in January after a half-century of continuous service with his company.

● **Bernard J. Clarke** has been promoted to chief supervisory engineer in the engineering and research department of the Columbia Gas System Service Corporation in New York.

● Board of directors of Pacific Lighting Corporation has elected **Robert W. Miller** chairman of the board and **Robert A. Hornby** president. Miller's elevation to board chairman fills a post vacant since the death of the company's founder, C. O. G. Miller.

● **William E. Ferguson,** vice president and manager of production, and **Frank S. Williams,** vice president in charge of distribution, have been elected directors of the Ohio Fuel Gas Company of Columbus.

● **William N. Lindblad,** chief of the Pacific Gas and Electric Company Bureau of Tests and Inspection since 1942, has retired. Succeeding Lindblad as head of the Emeryville technical research center is **Frank G. Rothganger,** assistant chief for the past two years.

● **Walter H. Johnson** has joined Liquefied Petroleum Gas Association as staff engineer. He will coordinate LPGA's safety, technical education, and standards development work.

● **Thomas P. Murphy** has been appointed supervisor of public relations at Equitable Gas Company.

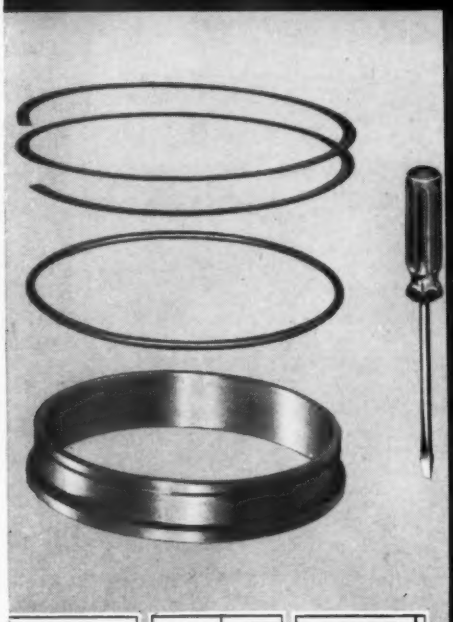
● **Richard T. Hess,** Ohio Fuel Gas Company manager in Mt. Vernon, has been named Cambridge division manager. Succeeding Hess is **E. D. Godfrey,** former New Lexington manager.

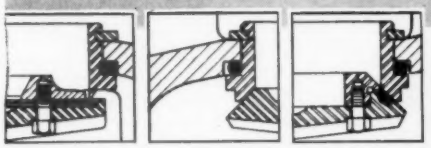
● **Bob Fink** has been promoted to assistant sales promotion manager of The Gas Service Company, Kansas City, Missouri.

. . . announcing

REYNOLDS' REMOVABLE ORIFICES

in single district station and high pressure line regulators which has been in use 3 years





METAL TO COMPOSITION VALVE SEAT

METAL TO METAL VALVE SEAT

METAL TO RUBBER VALVE SEAT

1. To remove orifice, a screw driver is the only tool needed.
2. Orifice may be had in any metal, normally stainless steel.
3. Types—Seats for orifices:
   Flat Disc—Composition or Leather
   Metal to Metal
   Metal to Metal with "O" ring
4. "O" ring between valve body and seat assures perfect parallel seating as well as perfect height seating. Does not require close valve height adjustment.
5. Valve seats may be sized as much as three regulator sizes smaller. For example, a 12" regulator may have inserted valves the size of 10", 8", 6" regulators.

GAS CONTROL Since 1892

Reynolds Gas Regulator Co.

ANDERSON, INDIANA, U. S. A.

TRADE NEWS OF THE GAS UTILITY INDUSTRY

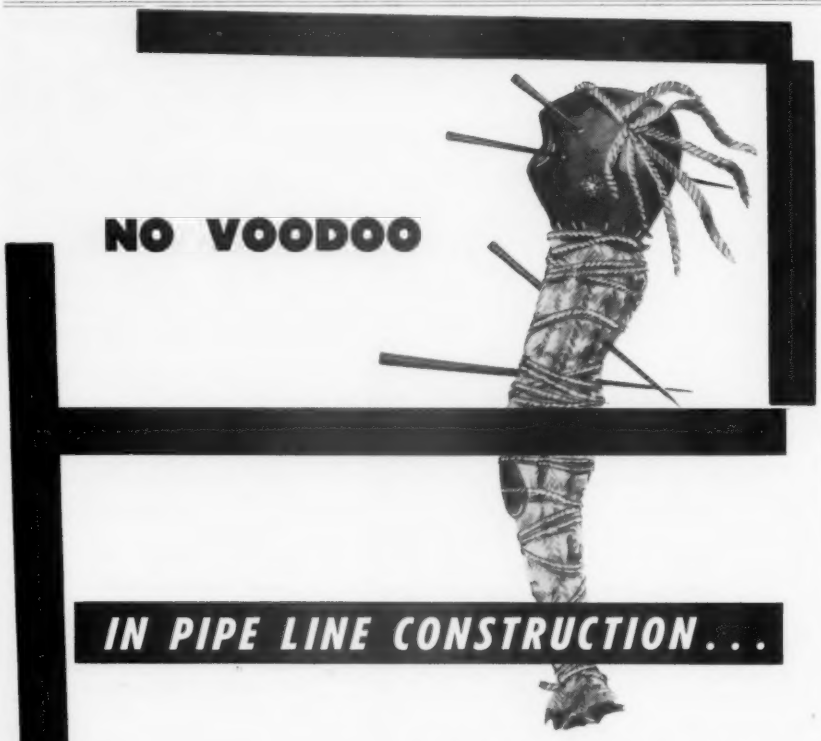
News Notes:

In Canada — U. S. Gauge, Division of American Machine and Metals, Inc., has appointed Brian Engineering, Ltd. of Montreal as agent for a portion of Ontario Province, and all eastern territory including Prince Edward Island. Also, two additional distributors have been appointed in the New York and Chicago areas: Miles W. Truesdell, formerly a field sales manager for USG, has opened the Truesdell Company in Newark, New Jersey; and the Ray Welch Company in Hammond, Indiana, has added USG to his other accounts.

In Chicago — Series of three-day commercial water heating training programs will be held by A. O. Smith's Permaglas division on April 15-17 and September 16-18 at the Product Service division. To enable men from all parts of the country to attend, other classes have been scheduled in Union, New Jersey, May 6-8 and October 7-9; in Oakland, California, March 4-6 and October 21-23; and in Dallas, Texas, March 25-27 and November 4-6.

In Alhambra, California — New ductile iron, called Relianite, is being made at American Meter Company's Reliance Foundry that combines the process advantages of cast iron with many of the advantages of steel. The metal will be made into castings for sale to other manufacturers and will be used in some American products.

In Texas — Future construction contracts hammered out $144,434,000 in January, a 12 percent increase over January 1956. Other major construction contracts, compared with a year ago, show non-residential, $53,001,000, up 23 percent; residential, $59,556,000, down four percent; and heavy engineering, $31,877,000, up 28 percent.



From original job estimate to final construction — the only "magic" involved in Sheehan's pipe line construction work is in *reliability* of performance.

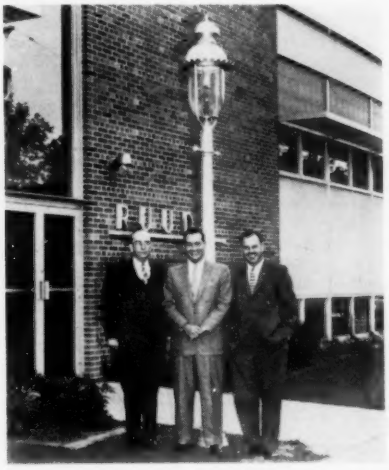
It is the competency of Sheehan service — in the office and in the field — that provides profits for you in any area of pipe line construction — regardless of size of the job or the conditions encountered.

SHEEHAN PIPE LINE CONSTRUCTION CO. TULSA OKLA

Let Sheehan's experience work for you on your next pipe line project.

SHEEHAN

NATIONAL BANK OF TULSA BUILDING
TULSA, OKLAHOMA



No not lamplighters — This "Gas light trio" point out how Ruud Manufacturing Company effectively dramatizes its historic affiliation with gas. Erected outside the entrance to Ruud's modern headquarters in Kalamazoo, Michigan, the old time gas street lamp is a reminder of the days of 1889 when Ruud first started making automatic gas water heaters. Left to right: Robert Lees, vice president, H. R. Basford Company; Ruud Pacific Coast distributor; R. F. Pemberton, assistant to the president of Ruud, and Otto Barth, manager of the Basford branch in Los Angeles, California.

In Philadelphia—Arndt, Preston, Chapin, Lamb & Keen, Inc., has been appointed to handle advertising for Cooking Controls Division of Robertshaw-Fulton Controls Company. The agency presently represents other company divisions including Fulton-Sylphon; Bridgeport Thermostat; and Fielden Instrument.

Sell and Service Servel — Four gas companies have been appointed utility-distributors for Servel gas refrigerators. They are: Montana-Dakota Utilities Company, Minneapolis, Minnesota; Western Kentucky Gas Company, Owensboro, Kentucky; Central Indiana Gas Company, Muncie, Indiana, and Iowa-Illinois Gas & Electric Company of Davenport, Iowa.

Show Strong Seasonal Gain — January shipments of gas water heaters were unusually strong although the figure was below last January's record total. Final tally totaled 227,300 units, representing a 4.9 percent dip from the 239,000 automatic gas water heaters shipped in January, 1956, but a wide gain from the 156,800 listed for December.

Trade Personals

● **Owen McComas** has been appointed to the position of national manager of new construction sales for the Day & Night Manufacturing Company, Monrovia, California. He will be responsible for sales and promotion for the new construction industry with all Day & Night's product line of water heaters, heating, and air conditioning.

Owen McComas

● **S. J. Grimm** has been promoted to northern zone manager of the Home Appliance Division of Servel, Inc. Formerly manager of builder sales, Grimm will be in charge of Servel's gas refrigerator sales in the northern half of the U. S.

E. M. Crary

J. C. Carlton

● **Edward M. Crary** and **James C. Carlton** have been appointed divisional sales managers, and **Clabe Long** has been named merchandising manager for the Appliance Division of Motor Wheel Corporation, Lansing, Michigan. Crary, eastern division sales manager, formerly served as an assistant sales manager for the Appliance Division. Carlton, western division sales manager, previously served as an assistant sales manager, district sales manager, and service manager for the Appliance Division.

Clabe Long

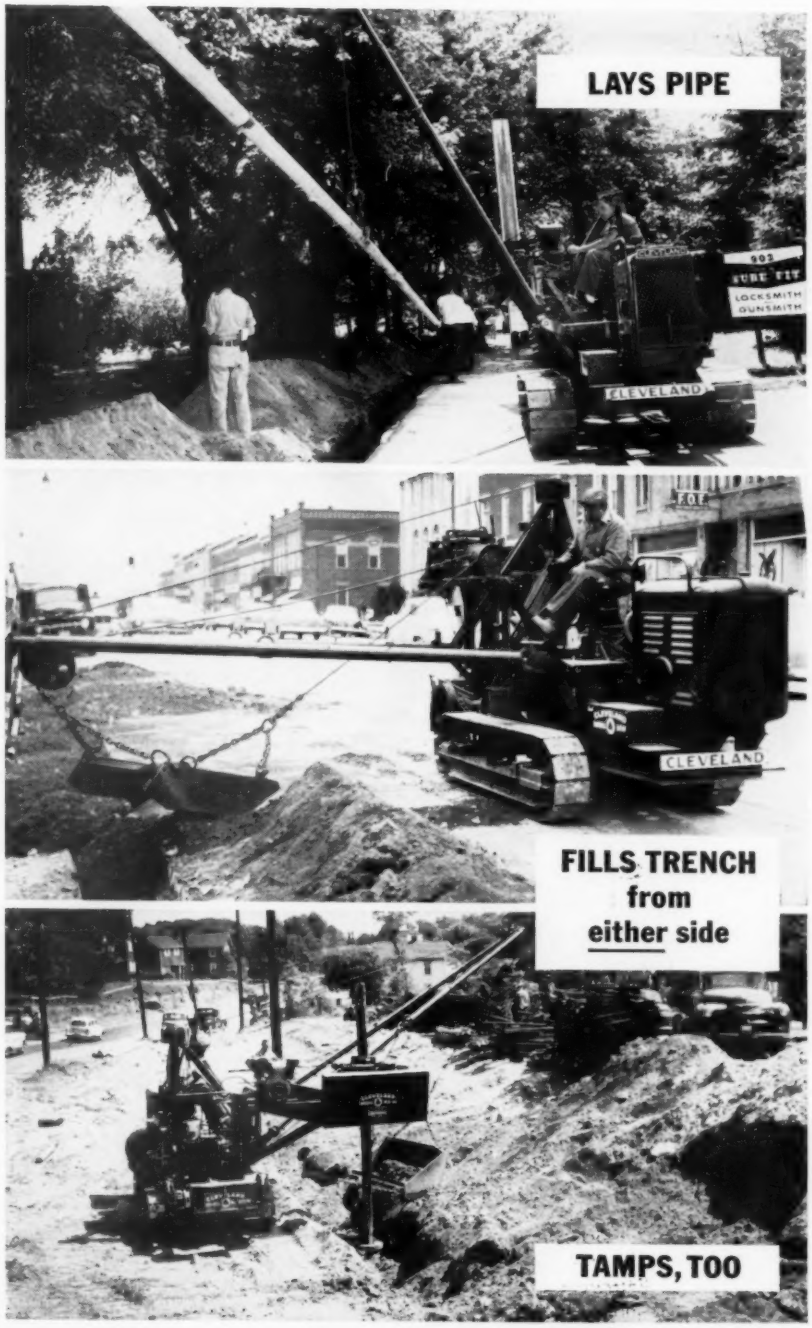
● **Walter F. Rockwell** and **Woodford D. Miller** have been elected to the board of directors of Robertshaw-Fulton Controls Company. They will fill vacancies left by the resignations of **Chauncey N. Mynderse** and **Clarence W. Robertshaw.** Rockwell was formerly chairman of the board of Acro Manufacturing Company of Columbus, Ohio, recently acquired by Robertshaw-Fulton.

W. T. Gettig

E. H. Sellers

● **W. Thomas Gettig,** general manager of Rockwell Manufacturing Company's Barberton, Ohio, valve plant, has been named assistant to the vice president in charge of the Meter and Valve Division. Succeeding Gettig is **Elton H. Sellers,** now works manager of the Barberton plant.

The Cleveland 80W
...a real money maker



Does All 3 Jobs Better...with Only 1 Man

THE CLEVELAND TRENCHER CO.

20100 ST. CLAIR AVENUE • CLEVELAND 17, OHIO

Good Everywhere

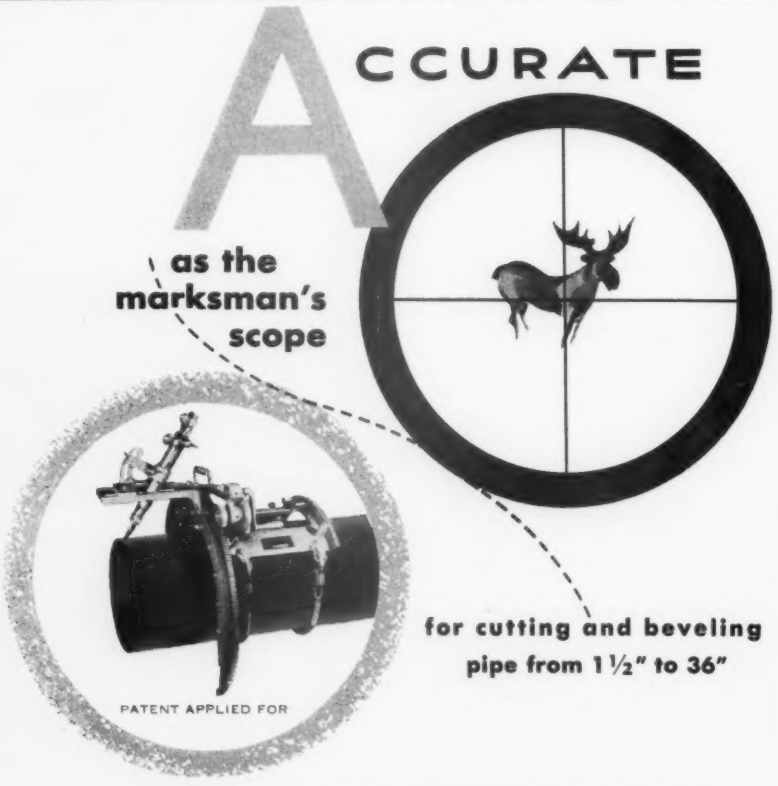
NEW EQUIPMENT
FOR THE GAS UTILITY INDUSTRY

For more information on items described here in brief, use the handy reply card and circle the corresponding numbers

Computing Telemetering System. A system of telemetering instruments designed to totalize several flow measurements, correct for such factors as temperature, pressure, specific gravity, and super-compressibility in fluids, and to provide a corrected flow value, has been announced by The Bristol Company.

This system of telemetering transmitters and receivers, and electronic self-balancing instruments can be used wherever corrected flow values are vital for proper operation. In a typical system, indicating or recording telemeter receivers retransmit the uncorrected flow values to a totalizing electronic instrument. At this stage, corrections for static pressure, temperature, and specific gravity are made, either by signals from other Metameter transmitters or by manual settings, and the corrected total is recorded and integrated if desired. *The Bristol Company.*

CIRCLE (1) ON THE REPLY CARD



PIPE CUTTING AND BEVELING MACHINES

The precision, accuracy and speed of preparing perfectly square joints for welding pipe from 1½" to 36" — is unequalled when you use H & M Pipe Cutting and Beveling Machines — in the field or in the shop!

Extremely light in weight, yet rugged enough for the toughest job, H & M Machines are simple.

Savings of one-half the cost in labor-gas-and-time in comparison to manual-cutting — makes H & M Pipe Cutting & Beveling Machines the most valuable equipment wherever pipe is welded!

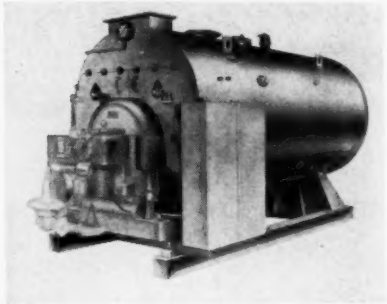
All H & M Machines can be easily and quickly motorized for automatic operation.

Write for illustrated bulletins.

H&M PIPE BEVELING MACHINE COMPANY
TULSA, OKLAHOMA
Trademark Registered 311 E. Third St. Diamond 3-0241

Shock-Absorbing Handle for Rock Drills. New shock-absorbing handles for use with Le Roi-Cleveland hand held rock drills are now available. Designed to absorb recoil and vibration, the new handles reduce operator fatigue, resulting in more efficient tool operation, and higher output at the finish of a day's drilling. Vibration is absorbed by rubber cushions incorporated into the mechanism of the new handle, which was designed for use with Le Roi-Cleveland R-10, H-12, and H-11 sinker drills. Handle adjustment can be made to suit operator's desired degree of vibration dampering. *Sales Promotion Department, Le Roi Division, Westinghouse Air Brake Company.*

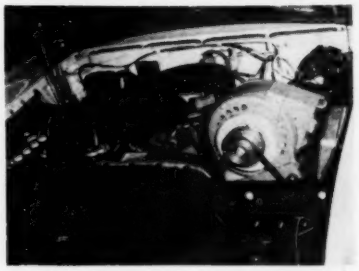
CIRCLE (2) ON THE REPLY CARD



Gas Boilers. Twenty-six new Scotch Type heating boilers for firing with natural or forced draft gas are now being marketed under the name "Queen of Scots" by National-U. S. Radiator Corporation. *Heating and Air Conditioning Division, National-U. S. Radiator Corporation.*

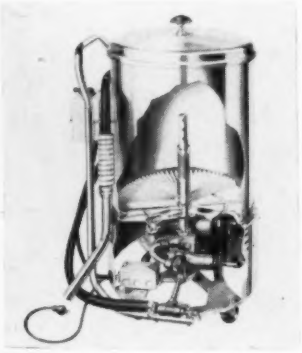
CIRCLE (3) ON THE REPLY CARD

Mobile Source of Electricity. Electric Controls, Inc. of Wales, Wisconsin, has announced a new Model CD 3500 heavy duty electric a-c generator for use by gas line maintenance crews. The ElectrolGenerAC is a high output 60 cycle a-c mobile alternator that will produce 3500 watts of 115/230 v single phase a-c power. The unique electrical design employed permits the GenerAC to successfully start and operate heavy duty compressor type a-c motor loads as large as 2 hp. A mobile source of a-c electricity, it can be mounted on and driven by most truck or tractor engines. *Electric Controls, Inc.*



CIRCLE (4) ON THE REPLY CARD

Fat Filter for Fryers. The task of filtering cooking fat has been simplified and made almost automatic by S. Blickman, Inc., of Weehawken, New Jersey. Manufacturers of food service equipment, they have introduced a new fat filtering machine called FRY-SAVER. The cooking fat filtering



machine, first to operate without any filtering aids, filters the cooking fat through a microscopically fine Porosite filter cartridge that removes all solids and other impurities in the fat. This new method of fat filtering is principally automatic, operating like a high-powered vacuum cleaner. Field tested for two years in restaurants and other commercial cooking operations where fried foods are an important item on the menu, tests revealed savings in cooking fat as high as 50 percent, and also provided that the chore of filtering fat can be a one-man operation. *S. Blickman, Inc.*

CIRCLE (5) ON THE REPLY CARD

Line Locator. Wilkinson's Line Locator is an electronic instrument for locating, tracing, and indicating depth of any subsurface metallic structure including transmission and distribution pipelines. Among the improvements that have been made to this widely used locator are: Etched receiver circuitry, that is, all circuitry completely enclosed in separate compartments that are easily accessible; cases made of phenolic, a hard, wear resisting, and long wearing material that insures permanent life to instrument. Also, antenna loops are built-in as an integral part of instrument cases. Embedded in moisture resisting cement, the loops remain perfectly and permanently protected. *Wilkinson Products Company.*

CIRCLE (6) ON THE REPLY CARD

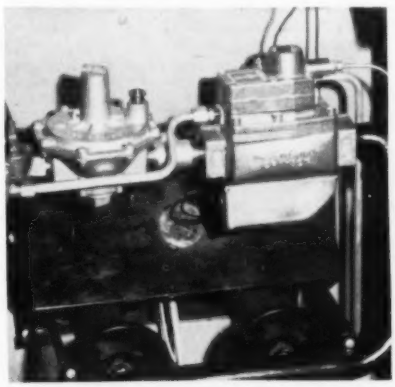
You are never fully dressed until you wear a smile.

How Are the Figures in Your Office? For effective control, Controller, the world's

smallest calculator, is now being marketed by Silver Bells, Ltd. No preliminary knowledge is needed as Controller is an automatic calculating device for all commercial and technical calculations. Aluminum construction, it weighs only one ounce with case. Does not wear, break, or rust and is not affected by climatic conditions. *Controller-Calculators, Division of Silver Bells, Ltd.*

CIRCLE (7) ON THE REPLY CARD

High Capacity Automatic Control. Development and production of a new-type control for high-capacity gas home heating has been announced by Robertshaw-Fulton Controls Company. The control, designated the HC-E, includes in one unit a positive snap-action gas valve, automatic pilot with 100 percent shut-off, and a built-in pilot filter. Developed for use on



central heating furnaces with ratings up to 200,000 Btu per hour, the control utilizes a new-type valve actuator as the thermoelement. This actuator rod type thermoelement eliminates the need for a solenoid and, as a result, the new-type control is virtually noiseless. *Grayson Controls Division, Robertshaw-Fulton Controls Company.*

CIRCLE (8) ON THE REPLY CARD

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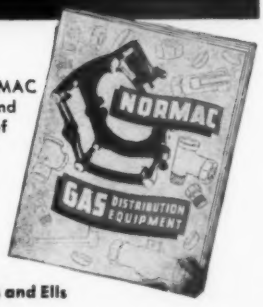

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Things to write for . . .

Bulletins, brochures, books of interest to gas utility industry people

Differential Pressure Sensing Unit. A six-page bulletin describing the differential pressure sensing unit (Model 224) and its use in the field of instrumentation and automation is now available from the Barton Instrument Corporation of Monterey Park, California. Unit actuates indicators, recorders, transmitters, controllers, and alarms, and is used for precise measurement of differential pressure, flow, and liquid level. The compact, light-weight device incorporates the patented Barton Rupture Proof Bellows principle, internal motion pickup, and torque tube transmission to the interior of the unit. *Bulletin No. 224-1, Barton Instrument Corporation.*

CIRCLE (41) ON THE REPLY CARD

New Continuous Furnaces. New four-page, two-color bulletin describing standard rated continuous heat treating furnaces is now available from Surface Combustion Corporation of Toledo, Ohio. Bulletin contains specifications, process recommendation, and application examples for Surface Snap Hearth, Cast Alloy Link Belt, and Brazing Furnaces. *Bulletin SC-177, Surface Combustion Corporation.*

CIRCLE (42) ON THE REPLY CARD

Automatic Gas Shut Off. A new brochure has been released covering the Watts Regulator Company's No. 500 Automatic Gas Shutoff valve. The bulletin F-500 describes the use of energy fuel shut offs over regular spillage type water relief valves where water supply conditions or building construction makes gas shut offs more desirable. The bulletin points out that this type of protection must be used in combination with a pressure relief valve. Because the Watts No. 500 valve is a positive acting energy shut off independent of all other operating controls, it must be manually reset in order to resume heater service. This serves as a warning of malfunctioning of the normal operating controls. *Watts Regulator Company.*

CIRCLE (43) ON THE REPLY CARD

Water Heater Catalog. Specification of 17 models of commercial gas water heaters are detailed in a new eight-page combination catalog and self-mailer available from Ruud Manufacturing Company, Kalamazoo, Michigan. Catalog covers commercial units in the three use classifications of the American Gas Association: Automatic storage gas water heaters, circulating tank gas water heaters, and instantaneous gas water heaters. Sizing tables show Btu input, hot water delivery at graduated temperature rises, and installation space requirements. *Ruud Manufacturing Company.*

CIRCLE (44) ON THE REPLY CARD

New Panel Wiring Techniques. A new eight-page bulletin just released by Stahlin Brothers, Inc., Belding, Michigan, outlines new raceway techniques for wiring of electrical and electronic equipment. Bulletin S-301 outlines methods for simplifying wiring operations from drafting room to assembly floor by use of raceways and pre-cut wires. It points out ways to improve appearance with one-third the work of bundling and lacing wires. A complete guide is also provided to all standard Panel Chanel raceways, giving specifications, part numbers, and sizes. *Bulletin S-301, Stahlin Brothers, Inc.*

CIRCLE (45) ON THE REPLY CARD

Lubricant Bulletin. Completely new 12-page version of Rockwell Manufacturing Company's comprehensive bulletin on "Lubricants for Rockwell-Nordstrom Valves," provides more detailed lubricant selection data, and includes information about 80 new lubricants. Four new lubricants not listed in previous bulletins are described in detail. They are: No. 555, a general-purpose lubricant for hydrocarbon liquid and gas services; No. 921 for strong acids and alkalies, alcohols, glycerine and glycols, amines, aqueous solutions, hot water, and hot asphalt; No. 860 for natural gas transmission line services, and No. 833 for aviation gasoline, jet fuel, hydrocarbon, and aromatic solvent services. *Meter and Valve Division, Rockwell Manufacturing Company.*

CIRCLE (46) ON THE REPLY CARD

Compressed Gas Association. New brochure has been published by the Compressed Gas Association, Inc., describing the organization's purposes, accomplishments, organizational structure, and the functions and work of its various committees. *Compressed Gas Association, Inc.*

CIRCLE (47) ON THE REPLY CARD

Engineering Manual. The Michigan Engineering Society has announced publication of "Manual of Consulting and Design Engineering Practices." The 20-page booklet contains: Outline of engineering services, definitions in outline of services, agreements and scope of services, bases for engineering fees, suggested percentage fee rates, estimating chart, sample agreement forms, and canons of ethics for engineers. Results of research by a committee of the Michigan Society, not only in Michigan but in many other states in the nation, brought forth a wealth of material and a pattern of fee schedules recommended for use in much of the nation. Copies are available to the public for a nominal sum. *Michigan Engineering Society.*

CIRCLE (48) ON THE REPLY CARD

Gas Heater Brochure. A 12-page three-color brochure outlining Temco Inc.'s 1957 product line of vented and unvented gas heaters is now available. Outlined in the brochure are features and specifications for all Temco models. Features include completeness of line, maximum heating efficiency, sales stimulating design, permanence of finish, and 20-year warranty on the heat chamber. Temco's "Lifetime" blue flame burner operates with equal efficiency on natural, manufactured, and LP-Gas. *Temco, Inc.*

CIRCLE (49) ON THE REPLY CARD

Combination Range Thermostat. A combination thermostat specially designed for use on gas ranges containing a section for room heating, is described in a bulletin available from Robertshaw-Fulton Controls Company. Model BJ-CR is a combination gas cock and thermostat with an automatic shutoff valve built into the body. The shutoff valve is actuated by a combination pilot burner and thermocouple and provides complete shutoff of the main gas supply if the pilot flame is extinguished. Bulletin RT-784 contains a detailed cut-away drawing of the control, as well as diagrams for installation. *Robertshaw-Fulton Controls Company.*

CIRCLE (50) ON THE REPLY CARD

Modern Quenching Techniques. O. E. Cullen, chief metallurgist, Surface Combustion Corporation discusses modern quenching techniques in a new issue of "Heat Treat Review." Various quenching media and temperature ranges essential to selection of suitable processes are fully illustrated by a series of tables, curves, and charts. *Heat Treat Review, Vol. 7, No. 3, from Surface Combustion Corporation.*

CIRCLE (51) ON THE REPLY CARD

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Standards — Guides for Tomorrow. A new book published by Standards Engineers Society contains 24 papers presented at the 1956 annual meeting of the society in Washington, D. C. The book is profusely illustrated with photographs and figures. Discussions included in the book are: Standardization of building materials, decimal dimensioning, standards for the median size company, metals standards, screw thread standardization, and management standards. *Standards Engineers Society. $3.75 for non-members, and $3 for members of the society.*

CIRCLE (52) ON THE REPLY CARD

Cathodic Protection Rectifiers. A new three-color eight-page brochure covering cathodic protection rectifiers is now available from the Good-All Electric Manufacturing Company of Ogallala, Nebraska. Included are photographs and design specifications on Custom Line, Add-A-Stack; Oil-Immersed-Regulator; Oil-Immersed with explosion-proof fittings; Type "N," and Gemco lines. *Good-All Electric Manufacturing Company.*

CIRCLE (53) ON THE REPLY CARD

New LP-Gas Emblem. A new membership emblem for the National LP-Gas Council of Chicago has been announced. Newspaper mats of the new emblem are available on request for tie-in advertising with the consumer advertising scheduled by the Council in national magazines during 1957. Gummed seals for mounting on point-of-sale displays are also available at cost. *National LP-Gas Council.*

CIRCLE (54) ON THE REPLY CARD

Carbon Production Bibliography. The Mellon Institute of Industrial Research has announced the free availability of a 39-page booklet, "An Annotated Bibliography of the Literature and Patents Relating to the Production of Carbon by the Decomposition of Carbon Monoxide," by H. Jack Donald. The literature review was conducted to determine the prior work on the production of carbon from carbon monoxide in order to obtain a qualitative review of the factors involved in the process. The material is divided into two sections: Patents, and literature reference. *Mellon Institute.*

CIRCLE (55) ON THE REPLY CARD

Corrosion Research Report. "Effect of Certain Variables on Corrosion of Gas-Fired Domestic Water Heaters," a report sponsored by AGA's PAR program is now available. Covering studies conducted at Case Institute of Technology under AGA's Domestic Gas Research Project DJ-4-WH, the report contains a concise summary of results and conclusions of the study and an evaluation of the water heater design variables with respect to corrosion rates and includes the effects of tank size, temperature of water, softened versus tap water, materials of construction of dip-tube, type of flue passage, weight of galvanizing and thickness of tank. *$1.00, American Gas Association.*

CIRCLE (56) ON THE REPLY CARD

Embezzlement Control. Practical methods of combatting embezzlements of money, merchandise, and other materials are described in a 32-page booklet, "Embezzlement Controls for Business Enterprises," by Lester A. Pratt, C.P.A., nationally-recognized authority on fraud prevention. Contains a check list for determining the adequacy of a firm's embezzlement controls. *Fidelity and Deposit Company.*

CIRCLE (57) ON THE REPLY CARD

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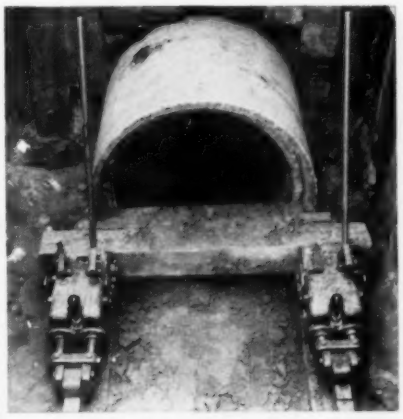

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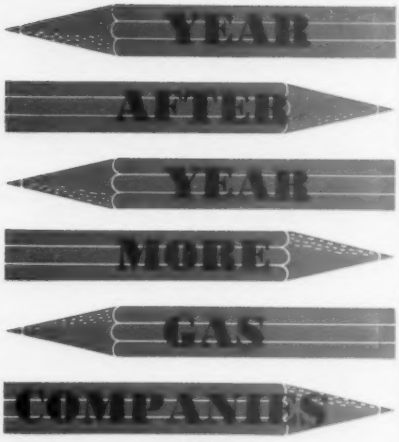

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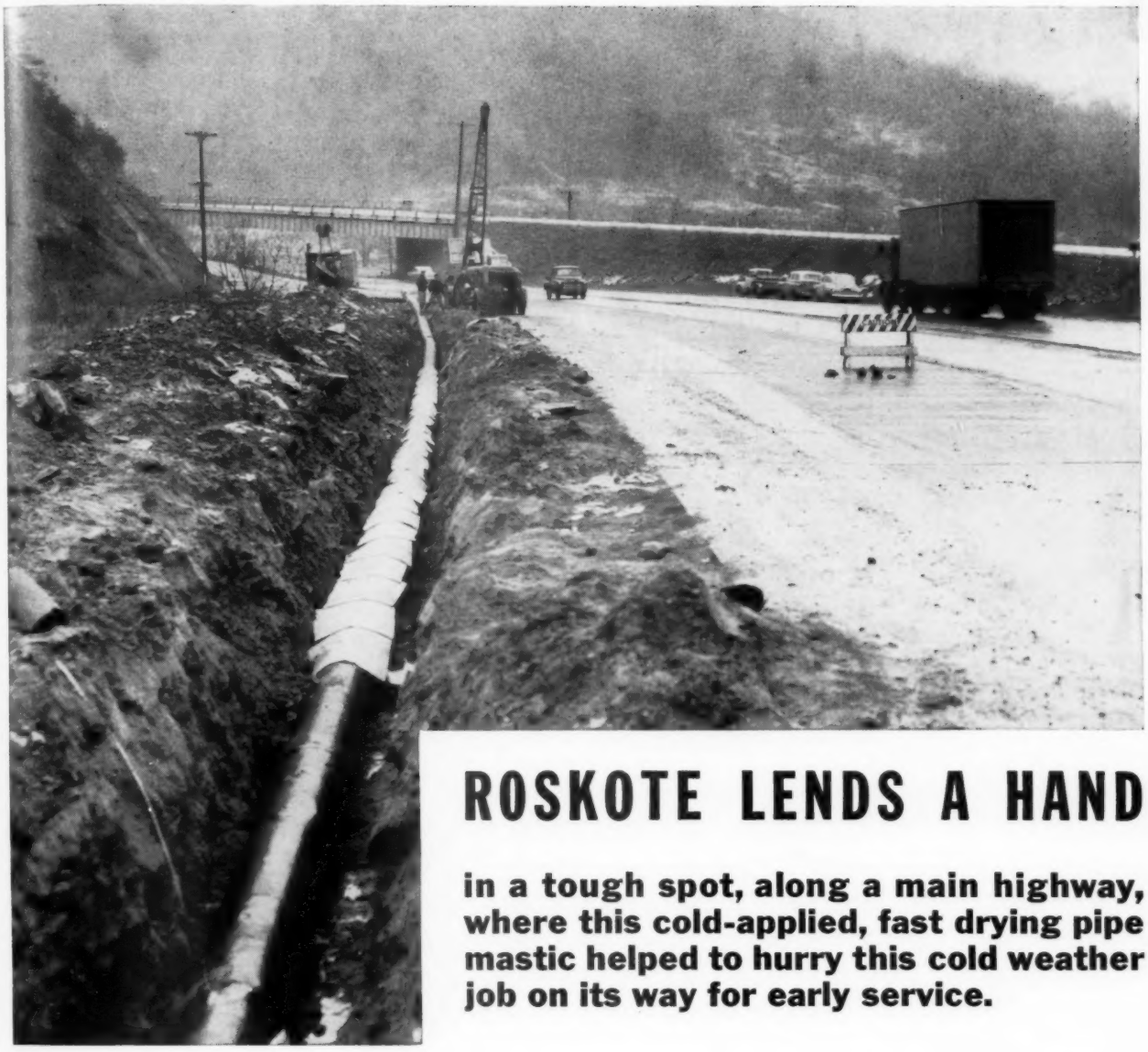

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